FEBRUARY, 1953

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

4th ANNUAL CARBIDES FEATURE ISSUE

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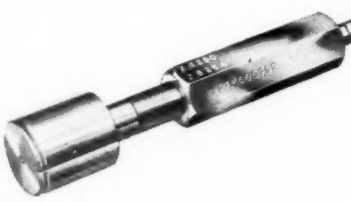
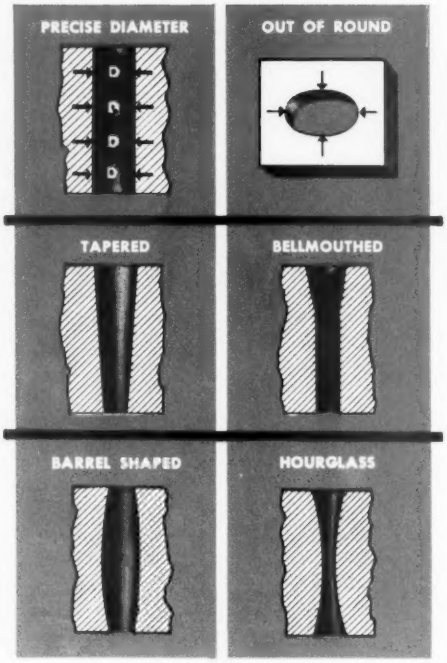


A PRECISIONAIRE STANDARD SPINDLE SHOWS WHETHER A HOLE IS:



A Precisionaire and *standard* spindle shows you instantly whether a hole is dimensionally O.K.—and, if not, *what* the error is, *where* it is, and *how* much.

Precisionaire spindles prevent accepting bad parts in Receiving Inspection. In Production Inspection they show when and how to adjust a machine *before* scrap is produced. They prevent passing incorrect parts in Final Inspection.

Other Precisionaire spindles and fixtures for single and multiple gaging of internal and external diameters, squareness, concentricity, center distance, etc., are readily available.

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Whether the hole being checked will assemble with a mating shaft of known diameter—It cannot measure any condition shown at the left.

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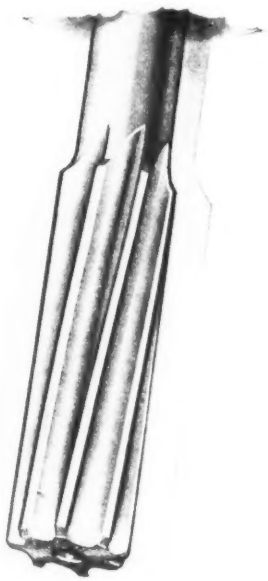

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The Reamer Specialists

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

Vol. VXIII, No. 11 FEBRUARY, 1953

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TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

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Every copy is directed to these men by name, by title and by company address. Please see our CCA verification.

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- Machines 30% faster
- Minimum tendency to pick up, scuff or gall
- Uniform response to heat treatment

PLUS

ADVANTAGES OF HOLLOW BARS

- No drilling
- Finish boring is first step
- Less machining time
- Less scrap loss
- More parts per ton of steel

EQUALS

ADVANTAGES OF "GRAPH-MO HOLLOW-BAR"

New "GRAPH-MO HOLLOW-BAR" combines the faster machining and longer wear of Graph-Mo with the economy of a hollow bar section.

Graph-Mo graphitic tool steel now comes with a built-in hole! "Graph-Mo Hollow-Bar" is a new Timken steel product that combines all the proven advantages of Graph-Mo with the economies of a hollow bar section.

If you make ring gages, dies or other ring-shaped tool steel parts, you can eliminate drilling. The hole is already there. Finish boring is your first step. You reduce machining time, cut scrap loss, save steel.

All this on top of the proven advantages of Graph-Mo steel itself!

Due to the free graphite in its structure, Graph-Mo machines 30% faster than other tool steels. Machinability tests prove it! And the free graphite, together with diamond-hard carbides, give it unusual resistance to wear. User reports prove it outwears other tool steels an average of 3 to 1.

Graph-Mo has minimum tendency to pick up, scuff or gall, gives uniform response to heat treatment, is the most stable tool steel made!

Only the new "Graph-Mo Hollow Bar" gives you all these advantages *plus* the economies of a hollow bar section. You can get "Graph-Mo Hollow Bar" in sizes ranging from 4" to 16" O.D. with a variety of I.D. dimensions. It's distributed through A. Milne and Company and Peninsular Steel Company and is available in the following cities: New York, Boston, New Britain, Philadelphia, Buffalo, Pittsburgh, Cleveland, Akron, Dayton, Toledo, Detroit, Grand Rapids, Indianapolis, Chicago and San Francisco.

For complete information on this new Timken steel product write today to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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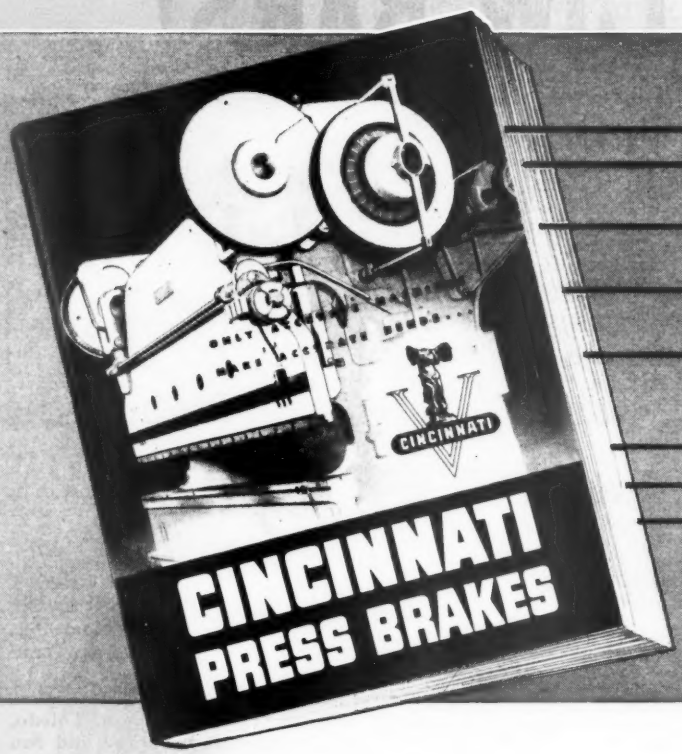

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- The Cincinnati Line of Accurate Press Brakes
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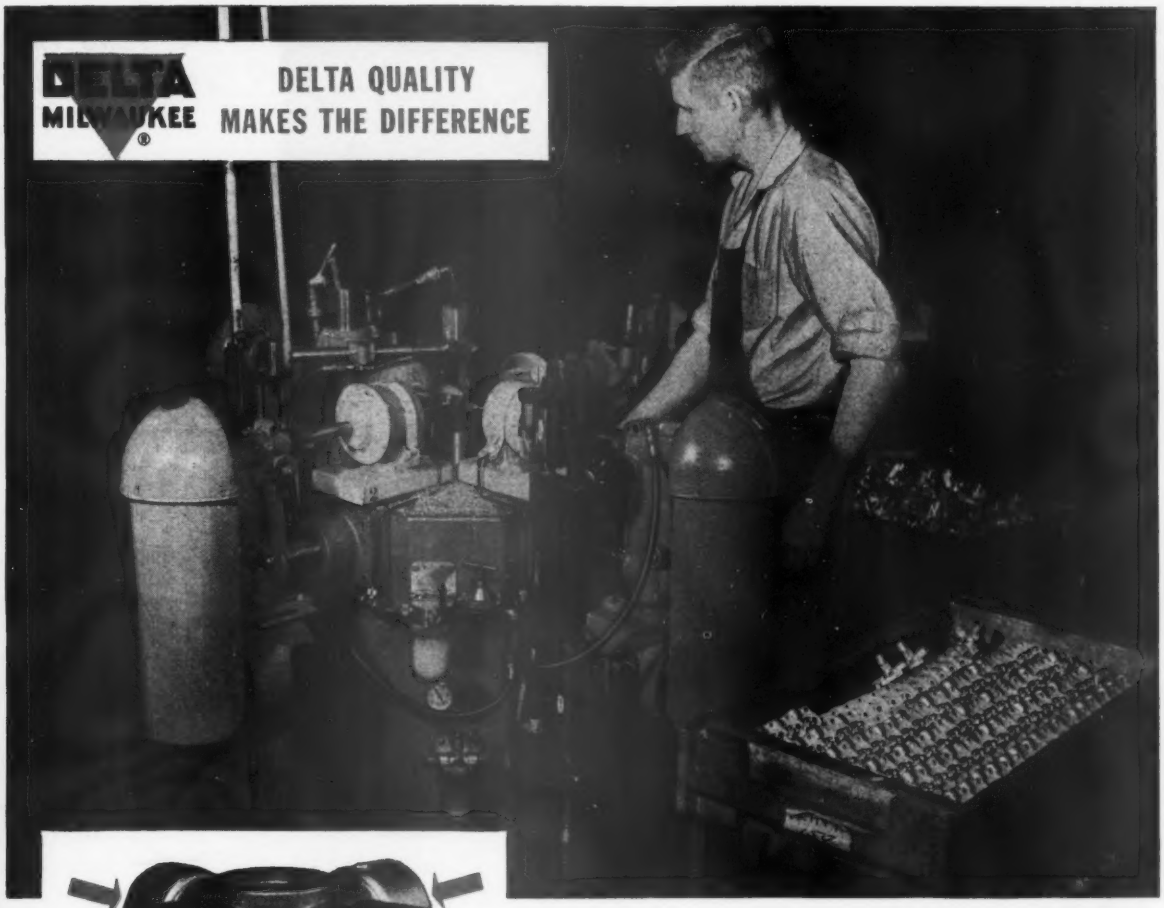

DELTA Drill Presses Plus Norgren Ingenuity Taps Four Holes in Time of One!

With standard Delta drill press heads and a little ingenuity tool engineers at the C. A. Norgren Co., Englewood, Colorado, designed this set-up for tapping four holes in bodies of Norgren oil fog lubricators and air pressure regulators in the time it used to take to tap one.

From a single control panel one operator tends the machine—loading, pressing a starter button and unloading at the rate of 300 pieces or 1,200 tapped holes per hour—a big saving in time and labor costs, and with a much more consistent thread than by hand tapping.

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DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

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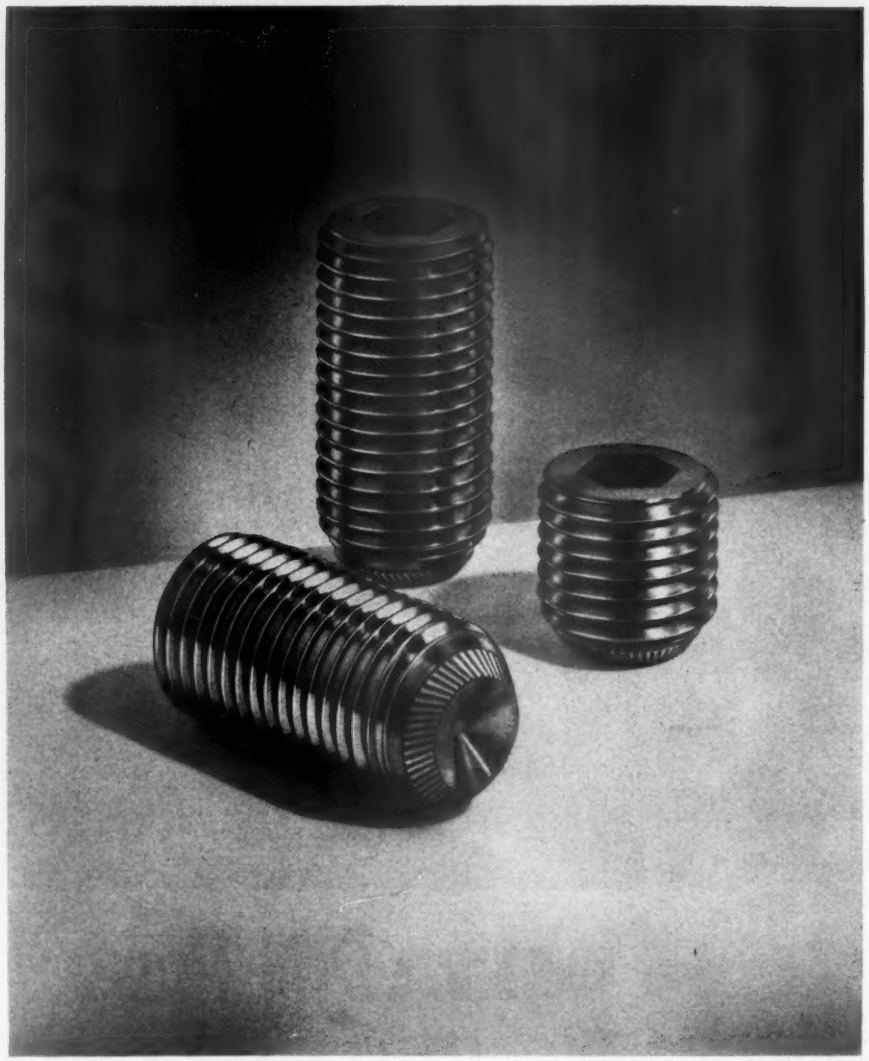

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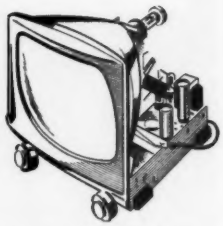

USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets, electronic equipment.

On refrigerators, washing machines, and other household appliances.

On power mowers, power saws and other power tools.

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A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for UNBRAKO Standards. SPS, Jenkintown 36, Pa.

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UNBRAKO® SOCKET SCREW DIVISION

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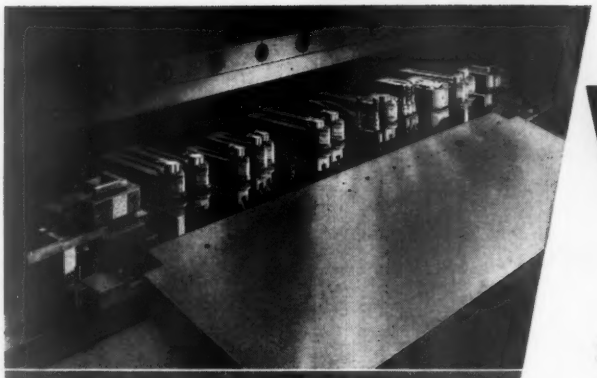
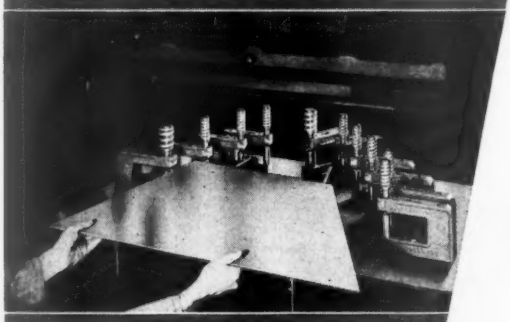
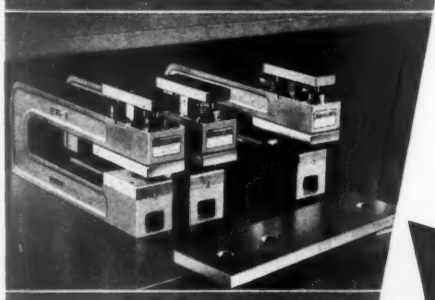


Showing Wales Type "BL" Hole Punching and Type "N" Notching Units in a combination press brake setup for punching and notching mild steel up to 1/8" THICK.



A stamping press setup of Wales Type "CJ" Hole Punching Units for punching mild steel up to 1/4" THICK.



Showing a setup of Wales Type "HS" Hole Punching Units in a press brake for punching mild steel up to 3/4" THICK.

Showing a setup of Wales Type "NJ" Notching Units in a stamping press for notching mild steel up to 1/4" THICK.

PUNCHING 1/8", 1/4" AND 3/4" THICK METAL?

standardize on

WALES

Hole Punching Units

Only Wales Hole Punching and Notching Units provide the numerous *patented features* plus the *time and cost saving advantages* that have made it "standard practice" with thousands of metal fabricators to *standardize* on this *exclusive* equipment.

Wales independent, self-contained Units eliminate costly, single-purpose custom dies, reduce expensive setup time and practically eliminate press "downtime."

The same group of Wales Units may be interchangeably set up in stamping presses and press brakes. In many cases, setups of Wales Units are in production the same day a hole punching pattern is released by your engineering department.

The multiple advantages of Wales Hole Punching and Notching Equipment are too MANY to tell here, so write for fully-illustrated, functionally colored catalogs TODAY.

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also notching up to 1/4" thick metal

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MORE PARTS PASSED

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"a lone $38 carbide gage saves us $4,000.00 a year"—"we cut gage checking expenses $20,000.00 annually with carbide gages"—"our initial gage costs reduced $1,280.00 in nine months on a single part inspection"—

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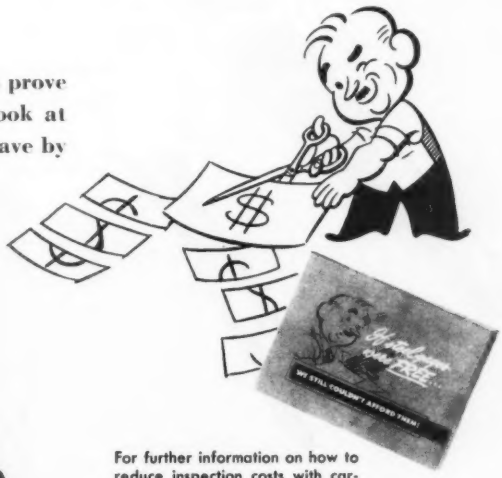

THE PLUS IN PRECISION

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Carboloy Cemented Carbide die built for Schick, Inc., in 1946 by Lincoln Park Industries under direction of Mr. George F. Eglinton. Die is still in daily use.

You get more carbide benefits with Carboloy dies and services!

For blanking, forming, drawing and piercing dies that will stand up under terrific hour-after-hour pounding . . . always specify Carboloy Cemented Carbide.

It's quality-controlled by 29 rigid, probing tests that stem from Carboloy experience as world's largest maker of cemented carbides.

You get extra die life from Carboloy Cemented Carbide — hardest metal made by man — because extra life is built into it!

Carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. You get all carbide benefits . . . and final finishing and assembly into your dies are easily done in your own toolroom, or by your die maker.

Carbide specialists

Carboloy Field Engineers are ready with on-your-job solutions to tough die problems . . . and ready to help you design new carbide applications.

Carbide training

Your key toolroom personnel can learn latest carbide techniques, become expert in finishing and servicing carbide dies at the Carboloy Customer Training School.

Carbide data

For a handy, all-inclusive guide showing how easy it is to design, use and maintain carbide dies, write for the Carboloy Die Engineering Manual, D-124.

To get the complete story of how Carboloy dies and engineering services offer more carbide benefits . . . greater production with less downtime and maintenance . . . fewer rejects and less refinishing . . . call in your local Carboloy representative or use the handy coupon below.

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DEPARTMENT OF GENERAL ELECTRIC COMPANY
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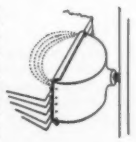
Plants at Detroit, Michigan; Edmore, Michigan; and Schenectady, New York

Magnet ideas for the shop!

Use Carboloy Permanent Magnet Sheet-Steel Separators to prevent feeding of doubles. And use permanent magnets to give an extra hand all around your shop. They're great for magnetic stands, tool-holding devices, sweepers' pickup tools, magnetic paper grippers, containers for small parts and magnetic retrievers. Write for Carboloy Permanent Magnet Stock Catalog, PM-100. (Use coupon.)



CARBOLOY Department of General Electric Company
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☐ Die Training School ☐ Die Engineering Manual, D-124 ☐ Permanent Magnet Stock Catalog, PM-100 ☐ Have a Carboloy Field Engineer call.

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Company_____

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Power, Precision, Capacity

For Accurate HEAVY-DUTY Drilling!

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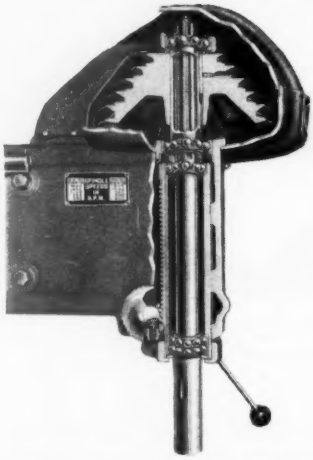
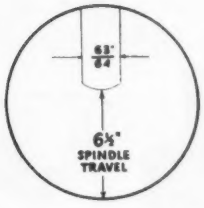
18" HEAVY-DUTY DRILL PRESS



Construction of head, spindle, quill, and bearings of the Clausing 18" drill press assure precision work and lasting accuracy. Quill guides, drive bearing housing, and column bearings are line bored. Spindle is 6¾" precision-ground steel. Quill is also precision-ground steel, 2⅜" in diameter with 5/16" thick walls. Spindle turns on precision-type ball bearings spaced 8½" apart. Upper bearing is sealed for life. Note the special double-row, double-shielded lower bearing—BOTH races of lower bearing absorb drill and radial thrust. Bore is No. 3 Morse Taper. The Clausing is the only 18" drill providing all these features for greater tool and job capacity.



The spindle is special tough precision-ground steel, 6¾" in diameter. Bore is No. 3 Morse Taper. Spindle travel is 6½". The larger spindle provides larger tool capacity—the longer travel gives MORE JOB capacity and greater efficiency on production operations using quick-release chucks.

You can move BOTH the head and table with the Clausing positioning mechanism—an exclusive feature that reduces set-up time to a minimum.

Vernier depth stop with graduated dial and easy to read scale provides depth control accurate to .001"—a Clausing exclusive that improves accuracy, saves set-up time and effort.

Production oil table is big and rugged—a 95-pound casting with 13" x 18" precision-ground surface! Has two 13/32" T-slots spaced 10" apart. Alternate choice of precision-ground 12" x 14" full-tilting table.

Column is 3½" diameter centerless-ground tube steel 72" long for accurate alignment of head, table, and base.

Base has 12" x 14" ground working surface for accurate handling of large stock. Has 17/32" T-slots, and 18" throat capacity. A solid, massive foundation for the entire drill press.

The Clausing 18" drill press is built especially for heavy-duty work—with heavier head, table, column and base—big precision ball bearings—greater tool and job capacity for drilling up to 1" in cast iron, ¾" in steel—plus many exclusive features to improve accuracy, save time. Put the Clausing to work in tool room, research lab, or 'round-the-clock production—you'll get greater production and accuracy with the smoothest, easiest operation you've ever seen. Send for the Clausing catalog.

CLAUSING DIVISION

ATLAS PRESS COMPANY

2-115 N. PITCHER STREET • KALAMAZOO, MICH.

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MR. BIG

. . . is proof of the superiority of

"Desegatized" Tool Steels

"Mr. Big"- being completely free of harmful carbide segregation is proof that a positive control exists for eliminating segregation.

"Mr. Big" could not be produced to the same high quality standards by any process other than the "DESEGATIZED" process.

To tool and die steel users "DESEGATIZED" means greater machinability . . . extra toughness . . . more uniform response to heat treatment . . . in short, a better tool or die.

"Mr. Big" is the largest perfect bar of high speed steel ever produced . . . 10 inches in diameter . . . 9 feet 6 inches long . . . and weighs approximately 2600 pounds.

See Products of "Desegatized" Steels

Latrobe STEEL COMPANY

General Office and Plant: Latrobe, Pa.

BRANCH OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

NEW T-J Spacemaker AIR CYLINDERS

CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

- SAVES UP TO 40% SPACE WITH NEW STREAMLINED DESIGN.
- SUPER STRENGTH . . . EXTRA HIGH SAFETY FACTOR
- SOLID STEEL HEADS
- HEAVY WALL, PRECISION HONED, HARD CHROME PLATED, SEAMLESS STEEL BODY
- LEAKPROOF CYLINDER HEAD TO BODY CONSTRUCTION.
- RELATIVE PORT POSITIONS MAY BE ROTATED WITHOUT DISASSEMBLY OF CYLINDER AND LOCKED IN DESIRED POSITION.
- HEAVY DUTY, HI-TENSILE, HARD CHROME PLATED PISTON ROD.

Streamlined construction of the new T-J Cylinders *eliminates tie rods . . . reduces head size . . .* and *saves up to 40% in mounting space!* In addition, a new high in strength is achieved with solid steel heads and heavy wall seamless steel body . . . leakproof construction . . . extra high safety factor.

Cylinder walls are precision honed and hard chrome plated for long-life efficiency. Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . both cushioned and non-cushioned . . . for wide range of pushing, pulling, lifting, clamping or control jobs. T-J dependability. *Fast delivery* to meet rush requirements. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.

37 YEARS EXPERIENCE

Many More Advanced Features!

T-J **TOMKINS-JOHNSON**

RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

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Approximately 2000 Penn
ing dies like those shown
are polished with 5 grams of
gin DYMO Diamond Abrasive.
n Diamond is faster, cleaner
and dies operate longer
before sizing and polishing is
again required.
ELGIN DIAMOND
COSTS LESS THAN
2 CENTS PER DIE!
. . . AT PENN BRASS and COPPER COMPANY of Erie, Pennsylvania, leading producer of tubing products. A 20% reduction in expensive die lubricating compounds and smoother tubing surface is also credited to the use of Elgin's DYMO-C* Diamond Abrasive in drawing die polishing operations.
Elgin Diamond, crushed, precision graded at Elgin and combined with an exclusive color identified vehicle in DYMO, will assure uniform, predictable polishing results and important savings in your plant. Be certain of the finest of fine finishes . . .
Finish with Diamond... ELGIN Diamond!
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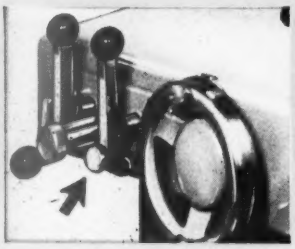
. . . FOR GENERAL POLISHING
DYMO-C
. . . FOR CARBIDES
C for carbides
ELGIN NATIONAL WATCH COMPANY
ABRASIVES DIVISION, DEPT D ELGIN, ILLINOIS

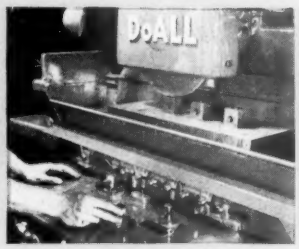
NOW... A GREAT

D-6 Models—6" x 18" and 6" x 24" sizes. Manual and hydraulic operation—7" wheels.

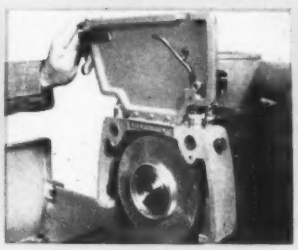
D-8 Models—8" x 24" with 10" or 14" wheels. Manual and hydraulic operation.



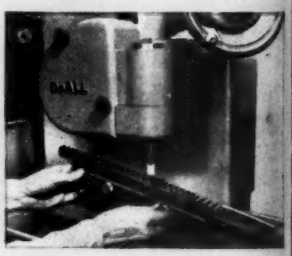
Variable speed wheel dressing feed.



Skip feed for intermittent plunge grinding.



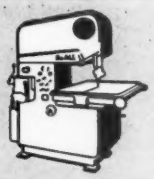
New flood and "Cool-Grinding" system.



High speed spindle, vertical or horizontal.

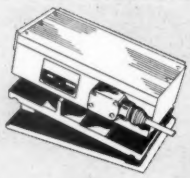
ATTACHMENTS and ACCESSORIES

1. **Coolant System** —"Cool-Grind" (coolant through the wheel) or flood grind, or both simultaneously.
2. **Coolants** for every job.
3. **New Laminated-top Magnetic Chuck.**
4. **Magnetic Sine Chuck**—for fast easy setups on single or compound angle work.
5. **Selectron**—for controlling magnetic chuck holding power—and demagnetizing.
6. **High Speed Spindle Attachment Vertical or Horizontal**—provides speeds up to 20,000 RPM, for use of very small wheels.
7. **Variable Spindle Drive**—electronic control provides infinitely variable speeds.
8. **Crush Dresser Spindle Drive**—slow-speed drive for wheel crushing.
9. **Crush Grinding Attachment**—provides steady table speeds down to 1" per minute—includes heavy duty spindle.
10. **Adjustable Crush Roll Idler Stand**—permits tilting of crush rolls.
11. **Motor-Driven Crush Roll**—for forming grinding wheel or crush rolls.
12. **Automatic Downfeed**—can be set to feed at each reversal, or alternate reversals of table.
13. **Automatic Skip Feed**—table travel speeds up between multiple work pieces when plunge grinding.

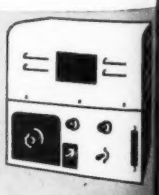


BAND MACHINES

MAGNETIC CHUCK



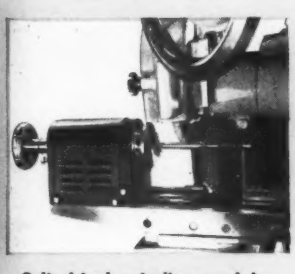
SINE CHUCK



SELECTRON

NEW LINE OF DoALL *Precision* SURFACE GRINDERS

D-10 Models—10" x 30" chuck with 10" or 14" wheels.



Cylindrical grinding and indexing attachment.

Slip rings for zeroing handwheels.

- *NEW* SIZES—including 6" x 24" and 10" x 30".
- *NEW* 12½" WORK HEIGHT CAPACITY.
- *NEW* SPEEDS—up to 100 fpm table travel.
- *NEW* RECIRCULATING "COOL-GRINDING" SYSTEM.
- *NEW* RIGIDITY AND STURDINESS.
- *NEW* ATTACHMENTS AND ACCESSORIES.
- *NEW* CONVENIENT CONTROLS.
- *NEW* FULLY AUTOMATIC OPERATION.

...and more!

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with a heretofore unattainable combination of precision and speed.

You have to see them perform to visualize their capabilities. Ask to have a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY
254 N. Laurel Ave. **Des Plaines, Ill.**

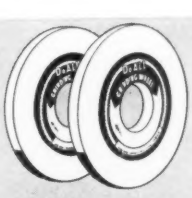
14. **Fully Automatic Surface Grinding**—controls cross-feed and downfeed automatically.
15. **Cylindrical Grinding Attachment**—for straight and taper cylindrical grinding and indexing.
16. **Dust Collector**—for all dry grinding operations.
17. **Wheel Dressing Diamonds and Holders.**
18. **Universal Vise**—completely adjustable for holding work in any position.
19. **Set of Plain Centers.**
20. **Wheel Balancing Stand and Arbors.**
21. **Grinding Wheels.**
22. **Complete Electrical Panel Remote Control Systems.**

DoALL

NEW CATALOG

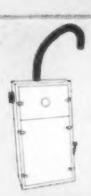
Free. Complete data and description of DoALL Grinder design and construction—coolant systems—controls—automatic setups—attachments. Ask for your copy.

COOLANTS

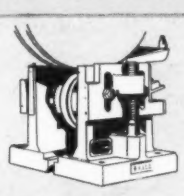


GRINDING WHEELS

DIAMOND DRESSER



DUST COLLECTOR



CRUSH ROLLS

GAGE BLOCKS

Here's that extra small size set you have needed!

20 out of 38 blocks between .05005" — .059"

Don't allow missing gage blocks to slow up inspection. When key blocks are being used elsewhere a second set comes in mighty handy.

The 38 block set is predominantly a set designed for small dimensions but serves adequately in supplementing larger sets.

In addition to costing less than a full size set it also has a wider range in small dimensions.

Twenty of the 38 blocks are in range between .05005" to .059". Every set includes wear blocks. Write for prices and description.

ACCESSORIES THAT MULTIPLY THE USEFULNESS OF STANDARD GAGE BLOCKS

When blocks are combined with accessories they serve as snap gage, height gage, ring gage, plug gage, calipers and scribers.

Webber GAGE BLOCKS

WEBBER GAGE COMPANY
12903 Triskett Road • Cleveland 11, Ohio

Largest exclusive manufacturer of precision gage blocks

HARDINGE
ELMIRA, N.Y.

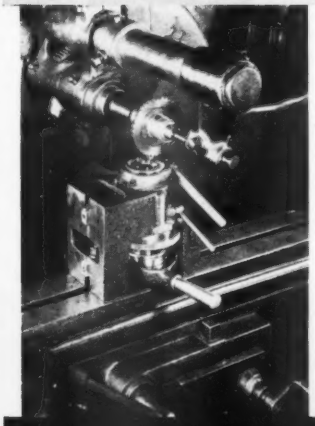
COLLETS for LATHES and MILLING MACHINES

Precision work requires precision collets. HARDINGE collets assure you of all-essential accuracy plus durability, because they are hardened and ground both internally and externally, and have heat-treated threads.

HARDINGE-SJOGREN SPEED Collet Chucks

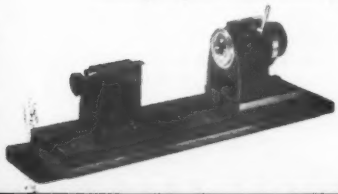
Increase machine capacity 25% to 40% with the fast action of a handwheel-operated HARDINGE-SJOGREN Speed Collet Chuck. Let your operators get the full use of your tool room lathes, engine lathes and grinders.

Five sizes: 1", 1 3/8", 1 3/4", 2 1/4", and 3 1/2" Collet Capacity; Threaded, Tapered Key-Drive, Cam-Lock, and American Standard Spindles.

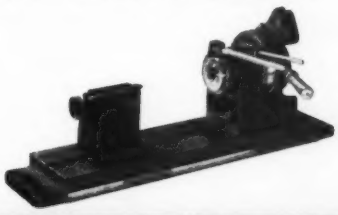


HARDINGE COLLET INDEX FIXTURES

The way to increased production is to hold work accurately and provide for rapid indexing. HARDINGE Collet Index Fixtures—H-4 for Tool Room and Inspection Departments; HV-4 for Production Departments—will help increase production on either new or old machines. Planned interchangeability for a variety of applications. Buy these standard fixtures instead of making expensive special fixtures



H-4



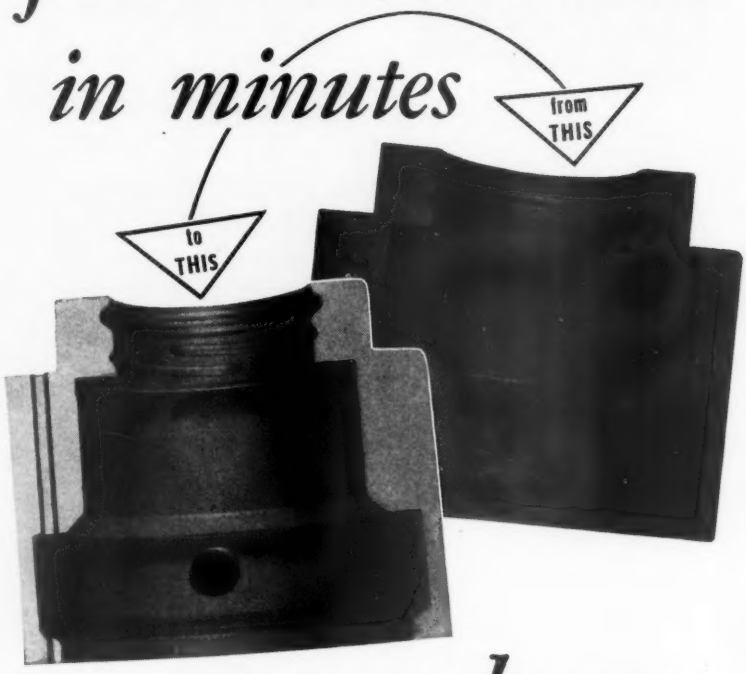
HV-4

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

finish TOOLS, DIES and MOLDS *in minutes*



...and *save hours* with LIQUAMATTE wet blasting

It takes only 30 seconds to 10 minutes to finish tools, dies, molds, engine parts, etc. with a Liquamatte — an operation that formerly required 1 to 6 hours by hand methods. Scale, fine burrs and grinding lines are removed in a fraction of the time previously possible. For example, savings as high as 80% have resulted on some parts at the Oling Tool Company.

Liquamatte Wet Blasting has eliminated many manual surfacing operations, transforming precision finishing into a mass production operation. It has eliminated all manual polishing except on surfaces where a mirror finish is desired. And the mirror finish is achieved in far less time on a Liquamatte finished surface.

See how Liquamatte Wet Blasting can save time and money for you. *Send today for the bulletins of your choice below.*

THESE BULLETINS TELL HOW

Save Time on Tools, Dies, Molds. Bulletin 43

Save Time on Glass Molds Bulletin 53

Save Time on Plastic Molds. Bulletin 63.

American WHEELABRATOR & EQUIPMENT CORP.

852 S. Byrkit St., Mishawaka, Indiana

LIQUAMATTE WET BLASTING

TOP NEWS for TOP MANAGEMENT

The industrial applications of closed circuit television are growing by leaps and bounds. It's another example of the transition whereby yesterday's curiosity becomes tomorrow's commonplace. If you need to see the workings of a remote process, watch the behavior of otherwise inaccessible machine movements, or make a closeup observation within a hazardous location, closed circuit TV offers a solution.

NMTBA

Swan E. Bergstrom, Vice President, The Cincinnati Milling Machine Co., Cincinnati, Ohio, was elected President of the National Machine Tool Builders' Association at its 51st Annual Meeting.

Herbert L. Tiggs, Executive Vice President of Baker Brothers, Inc., Toledo, Ohio, was elected 1st Vice President; and M. A. Hollengreen, President of the Landis Tool Company, Waynesboro, Pa., was elected 2nd Vice President and Director. Francis J. Trecker, President, Kearney and Trecker Corp., Milwaukee, Wisc., Treasurer.

New Directors elected, in addition to Mr. Hollengreen, were: J. C. Cotner, President, The Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, and Alan C. Mattison, President, Mattison Machine Works, Rockford, Illinois.

Tell Berna was re-elected General Manager of the Association, and Mrs. Frida F. Selbert was re-elected Secretary.

N M T B A 1 9 5 3

BERGSTROM

TIGGES

HOLLENGREEN

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

It isn't news that colleges and universities are enjoying greatly increased allocations of funds from industry for research, experimentation and development, it's common knowledge. **BUT,** how long since you've familiarized yourself with the spcific projects under way in schools within 50 or 100 miles of your plant? You might pick up some uncommon knowledge profitably applicable to your daily production.

NTDMA

At its recent seventh annual meeting the National Tool & Die Manufacturers Association elected the following officers: Alfred Reinke, President of Gus Reinke Machinery & Tool Co., Hillside, N. J., President; Herbert C. Murrer, President of Murrer Tool Co., Inc., Cincinnati, First Vice-President; Jerome H. Stanek, Vice President, Stanek Tool & Manufacturing Co., Milwaukee, Second Vice-President; Joseph N. Huser, President of B & H Specialty Co., Inc., Indianapolis, Secretary (re-elected); and Philip R. Marsilius, Vice-President of The Producto Machine Co., Bridgeport, Conn., Treasurer.

MURRER

STANEK

NTDMA 1953

REINKE

HUSER

MARSILIUS

IF THIS IS YOUR PROBLEM

TRACER TURNING TOUGH ON TOOLS?

These tools will solve it!

Tracer turning has this great advantage —higher production rates can be attained, using far less skilled operators' time than is required for the conventional "cut and try" procedure.

But—any tracer lathe is only as good as the cutting tool it drives. The burden on the tool is great. It must have ruggedness for heavy stock removal and a long-lasting cutting edge able to maintain accurate duplication throughout the complete machining cycle.

Kennametal pioneered this field—has developed carbide tooling for light and heavy tracer lathe jobs, including roll profiling. With this tooling, tracer turning has reduced machining time as much as 80%*.

Our engineers will cooperate with you —give you the benefit of their industry-wide experience—develop the most suitable Kennametal tooling for your tracer operation. Write, telling us your proolem. Kennametal Inc., Latrobe, Pa.

*Performance studies will be sent upon request.

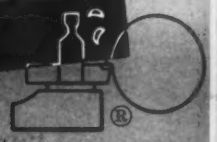
KENNAMETAL CLAMPED PROFILING TOOL

KENNAMETAL BRAZED PROFILING TOOL

KENNAMETAL HEAVY DUTY TRACER TOOL

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY



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SOON TO APPEAR IN FUTURE ISSUES

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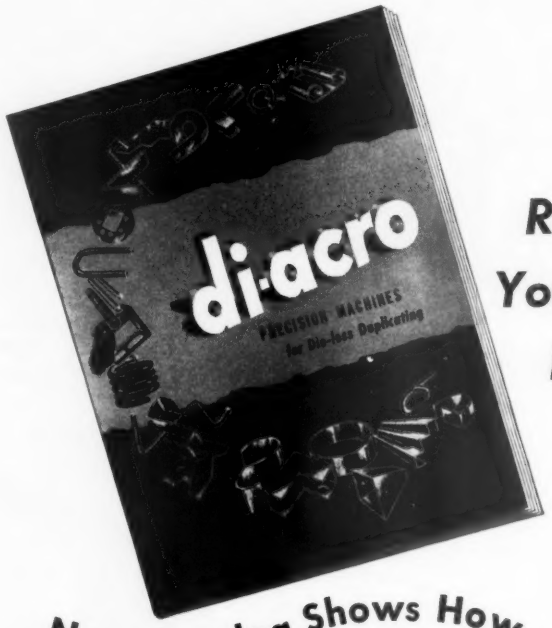

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New Catalog Shows How

"DIE-LESS DUPLICATING" SAVES TOOLING COSTS, SPEEDS PRODUCTION

Di-Acro is pronounced Die-ack-ro. It is the registered brand name for both hand and power operated Di-Acro Benders, Brakes, Notchers, Punch Presses, Rod Parters, Rollers, and Shears.

New 32-page catalog, chock-full of operating photographs, shows the wide variety of parts that can be formed and fabricated—often without the use of dies—by Di-Acro Metalworking Machines. Gives complete machine specifications and material capacities on 36 hand and power operated models in handy reference tables. Explains Di-Acro Engineering Service—it has helped solve many problems. Write for your copy now.

di-acro

PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MANUFACTURING CO.
315 8th Avenue • Lake City, Minnesota

February, 1953

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A program for the conservation of diamonds in diamond wheels—the costliest consumable item in the successful processing of carbide tools.

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Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

For Precision Between Centers
EX-CELL-O
CENTER LAPPING MACHINES
Meeting today's precision standards requires careful checking of every phase of the job, including the center holes in the work. Ex-Cell-O Center Lapping Machines correct inaccuracies of center holes that affect the quality of all subsequent operations performed between centers. These machines are precision built and are easy to operate. They are fully described in Bulletin 40271—a copy is yours for the asking.
EX-CELL-O
BEFORE LAPPING
AFTER
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
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SFK 6875	.625	.687	1"
SFK 750	.625	.7495	1-1/8"
SFK 8125	.625	.812	1-1/8"
SFK 875	.625	.8745	1-1/8"
SFK 9375	.750	.937	1-3/8"
SFK 1000	.750	.9995	1-3/8"
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editorial

A RENEWED SPIRIT OF ENTERPRISE

The outlook is brighter than ever for the tooling industries.

For many years past the designers, builders and users of production tooling have labored amidst an economy of scarcities; scarcities of materials and scarcities of incentives.

The scarcities of material have been due to the abnormal demands of the war years and, more recently, of the accelerated defense program.

The scarcities of incentives have been due to an administration-sponsored government philosophy of antagonism to business, of twenty years standing.

Certainly it can be said that our current well being and material prosperity have been attained in spite of government attitude rather than because of it. It is quite noteworthy that the outgoing administration was moved to concede that "Invention and business initiative have more than kept up with the rise in the number of men and women seeking work and have made it possible for them to find better jobs."

Now we face a new future. We are moving into an economy of plenty; plenty of materials, and plenty of incentive through promise of freedom from government meddling and promise of business efficiency in the conduct of government affairs. President Eisenhower has evidenced beyond doubt his realization that through business enterprise and productivity we can do more for ourselves and the free world than by any other means.

Our prediction for a brighter-than-ever outlook for the tooling industries is based on the fact than an economy of plenty includes also plenty of competition. An economy of scarcities means order taking. An economy of plenty means selling—competitive selling—competition for the consumer's dollars.

The snow-balling and momentum of competitive selling are attained only by offering something new—new products and new models of old products. New products and new models mean new tooling and retooling, new tools for building tools, and new facilities and machines for building the new products.

Current reports from many special tooling sources indicate accelerated tooling and retooling activity in consumer product lines, particularly in those lines where competition is keenest. These include the radio and television branches of the electronics family, household appliances, heating and ventilating equipment, hardware, and automotive.

Before any of these new products appear in the dealers' windows the special tools and machines, jigs and fixtures have to be contracted for, designed, built, and put to work.

Today's high level of inquiries from manufacturers for new tools of production presages many enticing packages competing for Mr. and Mrs. Householder's budget.

Competitive selling means that everything possible must be done to keep prices basically competitive. When a manufacturer gains a price advantage by effecting cost reductions through more productive tools and machines, his competitor cannot rest on his oars. He too, must redesign, retool and re-equip or he will cease to be a successful competitor.

A brilliantly conceived product sales and advertising campaign isn't worth a carbon copy unless and until it is backed up by the skills and functions of the production managers, the machine tool builders, the special machine designers, the die engineers, the methods and assembly engineers, and the quality guarantors.

Today, with customers having to be sought out rather than being found standing in line, the tooling industries stand on the threshold of an intensified demand for their ingenuities, skills, and tools.

E. Willard Pennington

editor

WRITE FOR BULLETIN No. 521

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CEMENTED CARBIDES
...their Development and Application

PART ONE OF TWO PARTS

by **Lee H. DeWald**
Chief Metallurgist
NATIONAL CYLINDER GAS COMPANY
Chicago, Illinois

IT IS INTERESTING to speculate on the extent to which we humans are dependent on the vagaries of the element carbon. It is in the food we eat, the air we breathe, the clothes we wear, and the wood used for the construction of our homes. It is the important constituent in our industrial, domestic and transportation fuel; and, what would steel be without its carbon, but merely another chunk of soft iron.

An exceptionally pure form of carbon is the very hard, but beautiful, diamond used for ornamentation and for certain drilling, cutting and grinding operations. Carbon is also the base of a series of hard substances called carbides, which have become very important in our industrial structure, and which will be the substance of our discussion in this paper.

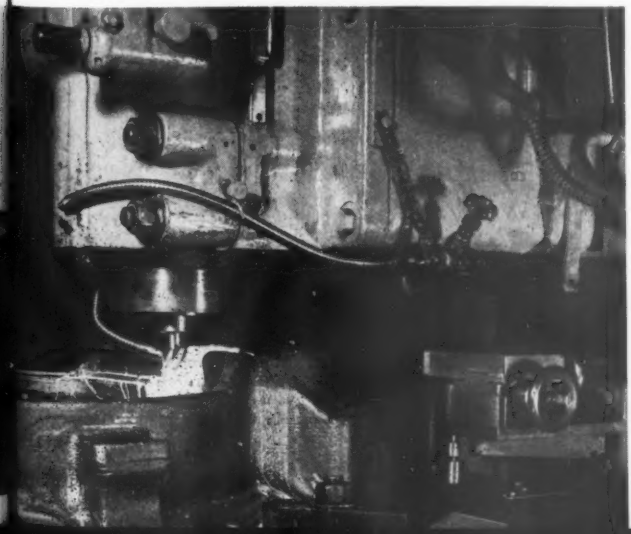
The term "carbide" is the generic name for these chemical compounds, but the preparation of the final product, of which these compounds are the predominating constituent, involves cementing particles together into an agglomerate, which is then referred to as a "cemented carbide". Unfortunately, there is a great deal of confusion in the terminology caused by the use of the words "tungsten carbide", used synonomously along with the trade names "Carboloy", "Vascoloy-Ramet", "Kennametal", "Firthite", "Carmet", or "Wessonmetal", to denote all the industrial cemented carbides. In this paper the words "cemented carbide" will be used to mean any of the carbide-binder combinations, while the word "cementing" will refer to the heat treatment in which the carbides are made to combine with a bonding medium.

In order to orient ourselves regarding the logic behind our present methods of fabricating these materials, let us briefly survey the history of the development of these very interesting materials.

From 1914-1917 the demands of the German lamp industry for a hard material to replace the costly and easily broken diamonds used for wire-drawing dies, began a renewed study of the hard compounds which were first prepared by the Frenchman, Henri Moissan.[1] At the turn of the century, Moissan, experimenting with his newly developed electric arc furnace to produce high temperature reactions, created some very hard crystalline carbides, borides and silicides, which were very interesting scientifically, but without value industrially.

Voightlander and Lohman in 1909 had begun experimenting with electric arc fused castings, but this work was abandoned because of the difficulty in obtaining a satisfactory casting. The castings that were produced had an uncertain composition, were sensitive to changes in temperature, and were very brittle and difficult to process into final shape.

About this same time, Lohmann[2] alone was trying to sinter the pulverized carbides without a bonding agent at a temperature just below their melting point. The resulting material, as one would expect, in the light of



Of tremendous importance to our current defense efforts is the ability of carbide tools to effectively machine tough, heat treated armor steel castings, such as this Cadillac tank cupola.

modern knowledge, was still very brittle, but did possess greater wear resistance than had ever been developed before. Recent advancements in tool design, which provide much greater support to the hard material, and concomitant improvements in production techniques have revived its use.

Baumhauer[3], in 1922 utilizing an impregnation method developed by Gebhart in 1912, pressed compacts of tungsten carbide powder which, after sintering, were soaked in molten iron or nickel. In this way the molten metal was drawn into the interstices of the porous compact by capillarity. This resulted in a more satisfactory product; but, like results of previous experiments with these materials, it lacked homogeniety and reproducibility. This process, with some modifications, also has been revived for the preparation of certain mechanical and heat-resisting parts.

Schroeter, Fehse and Skaupy[4,5] also about this time, at the Osram Gesellschaft, developed a powder metallurgical method of incorporating a powdered metallic cementing agent in the powdered carbide which lent itself much better to close process control and produced a remarkably strong material at the sacrifice of only a small portion of its valuable properties. The Krupp organization in Germany was quick to recognize its value as a superior cutting tool and took over its production and marketing under the trade name of "Widia", which is a contraction of the German expression "Wie ein diamant, or "like a diamond". American industrial concerns soon became licensed to produce the material in the United States, which quickly resulted in its widespread application.

Principal Property—Hardness

The principal property possessed by these cemented carbides, which made them desirable for the severe application of metal cutting at high speeds, was high hot hardness. It is obvious how important this property becomes when one considers how intimately the success of many devices, such as the jet engine, the gas turbine, rockets, etc., is tied to developments in heat resistant materials.

Figure 1 shows how rapidly temperature increases with an increase in cutting speed. It also shows, in the right frame, to what extent the cemented carbides possess this most important property of hot hardness.

I prefer not to resort to a great deal of scientific verbiage in this paper, but to clarify certain phases of the subject it may be necessary to use a little specialized vocabulary which will become familiar with usage. For the sake of a better understanding of our modern processing techniques used to produce high hardness in a material, we should begin with a detailed discussion of the anatomy of hardness and hard substances. In Figure 2 the position of some of the more common hard carbides is shown in the old familiar Moh's scale of mineral hardness, with definite Knoop hardness values superimposed. It is interesting to note how soft our man-made materials are compared to the natural diamond.[6]

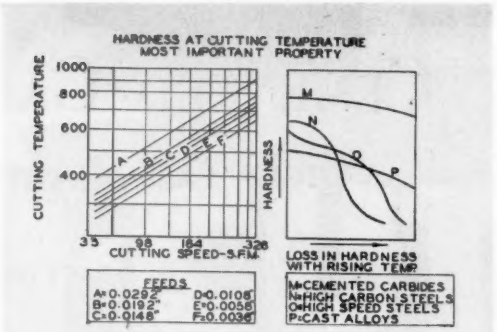


Fig. 1

Hardness can be defined as the capacity of a substance to resist permanent distortion, which is another way of saying that it is a function of the elastic limit of the substance in compression. Hardness is said to be greatest for materials of small atomic volume and high valence.[7] The valence of a substance refers to the combining capacity of its atoms.

The causes of natural hardness and some important associated properties are shown in

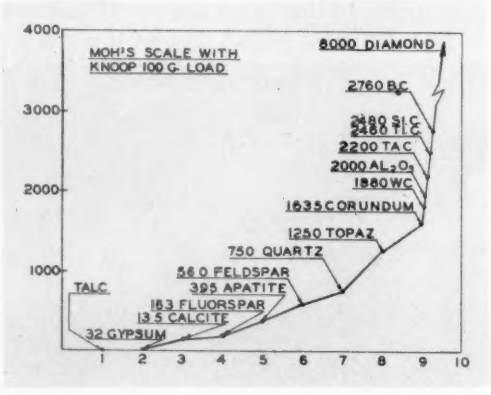


Fig. 2. Relative hardness of various materials: B.C = boron carbide, SiC = silicon carbide, TiC = titanium carbide, Tac = tantalum carbide, $A1_2O_3$ = aluminum oxide, WC = tungsten carbide.

HARDNESS TYPES AND PROPERTIES

NATURAL HARDNESS	SYNTHETIC (DEVELOPED) HARDNESS
Factors:	Factors:
Low Compressibility	Cold Working
Low Crystal Symmetry	Alloying
Low Atomic Volume	Refining Grain
Lattice Type	Dispersing Hard Particles in Softer Matrix

PROPERTIES ASSOCIATED WITH

NATURAL HARDNESS	SYNTHETIC HARDNESS
High Melting Point	No Definite Melting Point
Brittle	Relatively Strong
Anisotropic	Statistically Isotropic
Low Thermal Diffusivity	Relatively High Thermal Diffusivity
Strength at Elevated Temperatures	Hot Strength Somewhat Lower
Chemically Inert	Corrosion Resistance Lower
Wear Resistant	Wear Resistance May be Higher

Fig. 3

the left column of Figure 3. Crystal symmetry refers to the regularity in atomic spacing and the number of atomic planes over which slip or deformation may take place. The more complex the crystal structure, the shorter the length of slip, the harder the hardness, and the greater the resistance to deformation. The penalty, unfortunately, that nature exacts for this high hardness is a concomitant brittleness and a sensitivity to rapid changes in temperature.

Nature may also confuse us by imparting a hardness-associated property called anisotropism, which is characteristic of many very hard substances, particularly the diamond. This property is manifested by different property values when the measurements are made in different directions. The diamond, for this reason, must be oriented properly before it can be used as a cutting tool or wire-drawing die, in order to present the direction, possessing the optimum properties, to the working area. Some carbides also possess this property, but fortunately when the individual crystals are pulverized a statistically random orientation results, which, in effect, results in apparent isotropism. Isotropism is the contrasting condition which exhibits similar properties regardless of the direction of test.

Because of the intrinsic brittleness of naturally hard substances, their use for cutting tools, or for any other application where they may be subjected to excessive mechanical shock or pressure, is limited. A benign nature, however, has provided us with methods by which we may control this deficiency. We can, for example, harden soft metals by alloying with other metals and retain much of their mechanical shock resistance. We can also cold-work soft metals to increase their hardness without sacrificing much strength. Both of these methods involve some changes in the regularity of crystal construction, which increases the resistance to deformation.

Refining the grain is also a well-known method of increasing the hardness. Slip produced by applied stresses will normally stop at the grain boundaries, so it follows that if the individual grains are smaller it will shorten the distance over which slip can take place.[8]

Steel is an example of an ancient method of producing controlled hardness at will. It consists essentially of heating an iron-carbon alloy to a suitable temperature, depending upon the amount of carbon present, followed by rapid cooling. The carbon present as the carbide of iron, and soluble in the uncombined iron at elevated temperatures, is rejected by the iron where the solid solution is unstable. When the hard constituent dissolves in the metallic matrix, the hardness of the solution drops markedly and permits mechanical work, such as rolling, drawing, stamping, etc., to be done on it. However, when the hardening constituent is rejected, the alloy, by a change in solubility, becomes very hard due to the slip-blocking effect of the hard particles.

The mechanism of such control is described in Figure 4, which shows a series of cubes representing a cemented system, containing spheres which represent the hard constituent embedded in a softer matrix. The ratio of hard constituent to the matrix is the same in the upper three cubes. However, by reducing the diameter, and thus increasing the number of hard spheres, the specific surface (surface area per unit volume) has increased threefold. The lower cube contains the same number of large spheres as the cube directly above it, but 24 medium sized spheres and 96 small spheres have been added to fill in the vacant spaces. In this way almost as much surface has been added as that obtained by breaking up the eight large spheres into 27 smaller spheres as shown in the cube immediately above it and the one on the right.

The significant fact to be emphasized in this surface increase is that the hardness in a system of this kind will increase proportionately. If a hardness indenter were placed on each cube, the proximity of the point to a hard sphere will be greatest in the closely packed structure shown in the bottom cube, and the hardness reading would be correspondingly larger. Furthermore, as the specific surface increases, the binder film gradually becomes thinner and the distance through which the binder metal can slip or deform is decreased, which, of course, increases the hardness of the system. It is also important to note here that, due to the minute film of binder network, any slight change in its composition will, therefore, greatly affect its overall properties.

Cemented Systems

There are certain chemical and physical properties necessary in both the hard material and in the binder to make a satisfactory composition. The hard material should obviously be very hard and have a high melting point, as it is the predominating constituent, and these properties are fundamental in most carbide applications. Its strength should also be as high as possible, but it just isn't "the nature of the beast", which is the principle reason for the success of the cementing process. In order to make the hard particles adhere to the matrix, it is necessary that the hard particles dissolve or be wet very sparingly in the matrix binder. In the event they were very soluble an abnormal alloying action would occur, rather than a cementing action, and both the binder and the hard component would lose many of their individual characteristics which are so necessary to the overall properties of the cemented system.

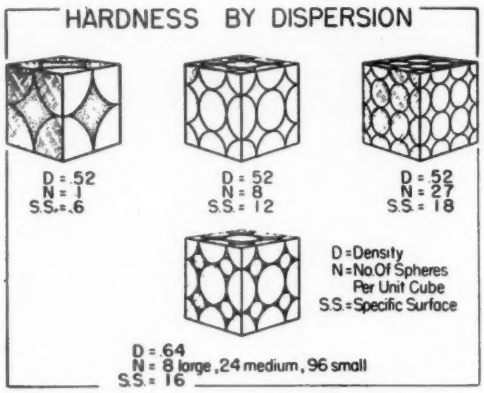


Fig. 4

After a suitable combination of binder and hard constituent has been selected, size distribution of the hard particles becomes the next important factor to be considered in the development of a satisfactory cemented system. Several types of size distribution curves are shown in Figure 5. Their density of packing increases from that of the inefficient packing of a single particle size system, as shown in the topmost curve, to the more ideal grading curve for maximum density, when the system is skewed to the coarse. A determination of average particle size would show very little difference in these types.

The various carbide-producing organizations have their individual methods of pulverizing the hard constituent, and base the properties of their finished product on the size distribution obtained by this method. Others may pre-select and pre-mix the proper size distributions, in order to obtain special properties. In many still-existent methods,

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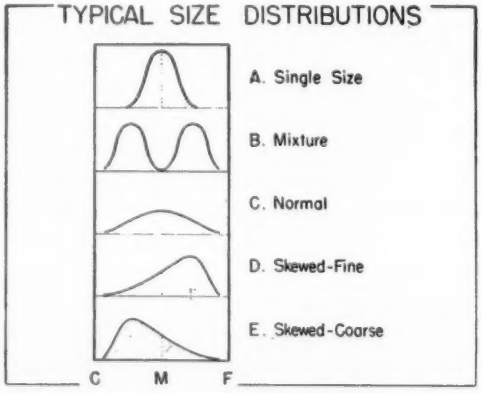

Fig. 5

CO_2 Freeze Grinding
... Promises Real Aid in Grinding Carbides

by John C. Welch, Jr.
Ceramic Engineer
A. P. deSANNO & SON, INC.
Phoenixville, Pennsylvania

THE USE OF LIQUID CARBON DIOXIDE as a coolant in grinding is a relatively new development. There are many questions yet to be answered concerning its use in a grinding operation, and in a variety of other applications.

The information presented here is based on the offhand sharpening of single point cemented carbide tools on a Hammond carbide tool grinder, using a gammeter-back (steel back mounted) cup wheel—14" x 4" x 11"—GC602 I02-VD2. This is a vitrified bond, green carbide wheel specially developed for use with CO_2 as a substitute for the standard resinoid bonded wheel which was found to break down too rapidly. The wheel is of special open structure, with a 2-size grain mixture predominately 60-grit.

The presently used name for the process "CO_2 Freeze Grinding" is misleading. The CO_2 does not freeze the metal, nor does it cool the metal; it merely prevents the metal from heating. Although the subject is controversial, it can be simplified by saying that its action as a coolant dissipates the heat the instant it is generated.

The liquid CO_2 flows directly from a cylinder to a suitable stainless steel nozzle. The jet of CO_2 is directed to cover both the wheel and the tool at the line of contact. The CO_2, under a pressure of approximately 800 lbs. per square inch, expands to a vapor when it reaches the atmosphere developing a temperature of –70° to –100° F. The principle of operation is thus based on a change of state from a liquid to a gas to carry away the heat.

CO_2 creates no health hazard in its use as a grinding coolant. There is no toxic effect, and there is no danger to the operator's hands.

Advantages

The following advantages can be expected by using liquid CO_2 as a coolant in grinding cemented carbide tools.

1. The principle advantage of using CO_2 is that the carbide does not heat in the normal complete rough grinding operation. By preventing localized over-heating at the point of contact you avoid cracking, checking, and chipping. Tool life is substantially improved.
2. The rough grinding operation is continuous, with no intermediate periods of waiting for tool to cool, thus giving a saving of up to two-thirds of the normal dry grinding time.
3. An excellent finish can be obtained using a coarse grit wheel. In many cases the finish obtained with the roughing wheel will merely require honing of the edge. In other cases the desired finish can be obtained by following with the use of a 120-grit green finishing wheel. The economics of using CO_2 on the 120-grit finishing operations have not yet been established. If an ultra-fine diamond finish is required, the operation is reduced to a polishing action. Tests indicate that the GC602 grain wheel will produce as fine as a 6 micro-inch finish. The grade of carbide and operator skill are factors to consider.

4. The steel shank and carbide tip can be satisfactorily ground at the same time. If the desired finish is obtained without the use of a diamond wheel, this would, in addition to eliminating the diamond wheel, eliminate the necessity of grinding two relief angles. The grinding time is thus reduced, and the operation requires less skill.
5. The operator has excellent vision of grinding operation at all times. CO_2 grinding has an added advantage over dry grinding in this respect, by the elimination of dust. The pressure of the CO_2 as it leaves the nozzle forces the dust down and away from the point of contact.
6. Greater wheel life can be expected due to fewer wheel dressings. The wheel not only takes a greater cut, but it appears to load less rapidly.

Grinding with CO_2

The successful adaptation of CO_2 as a coolant in grinding carbide is dependent on several factors:

a. The quality of CO_2 used.
b. The quantity of CO_2 used.
c. The type of abrasive wheel used.

The CO_2 used as a coolant in grinding operations must be in the form of a **dry** liquid. If the liquid is not dry, moisture will freeze in the lines and nozzle, thus interrupting the flow of the CO_2 and making the operation a general nuisance. Certain precautions can be taken to prevent this type of trouble from occurring.

1. Use a dry liquid CO_2.
2. A syphon type cylinder of CO_2 must be used.
3. Keep the length of the lines from the CO_2 storage to the machine at a minimum. On an experimental operation this would not be a problem; but, in a production set-up where one storage tank serves several machines, the lines should be insulated.
4. Maintain a minimum size diameter CO_2 supply line. A small line means the CO_2 will expand less, thus preventing an excessive amount of frost from forming. Tests suggest the use of hydraulic copper tubing $\frac{1}{8}$" inside diameter with .030" wall thickness.

Quantity of CO_2

The quantity of CO_2 used for a particular operation is the factor governing the economics of using CO_2 as a coolant. CO_2 grinding is still in the development stage; therefore, no definite figures can yet be given in regards to **Volume of CO_2** versus **Area of Work** versus **Stock Removable.**

CO_2 consumption must be kept at a minimum. Upon completion of a grinding operation, if the tool is cold, then too much CO_2 is being used. Again, the idea is not to cool the tool, but to prevent it from heating.

An experimental kit contains five sizes of stainless steel nozzles of the following diameters: .013, .020, .027, .042, and .054 inches. The rate of flow increases quite rapidly as the size is increased, and again the effective area of spray of each nozzle is not known. The greater the distance between the end of the nozzle and the tool, the greater the spray area; but, the temperature, and thus the cooling effectiveness, of the CO_2 is thereby decreased.

At present the operator must experiment on his own grinding operation to determine whether one large nozzle or two small nozzles will be the most effective and economical method of using the coolant. The nozzles are easily and rapidly changed, and this is the only method of controlling the quantity of CO_2 flow.

The use of an electrically-controlled solenoid valve in a grinding operation will, to a large measure, determine the efficiency of using CO_2 as a coolant. A foot switch control for offhand grinding would permit the flow of CO_2 only during actual grinding.

Type of Abrasive Wheel

The type of grinding wheel used in conjunction with CO_2 coolant is a determining factor, not only in the cool cutting effect, but also in the finish obtained. An open structure wheel, of a bond specially designed for this work, that will not tend to glaze when grinding the steel shank and carbide at the same time is recommended. In an open structure wheel the CO_2 lays in the wheel, which results in an even cooling effect from the top to the bottom of the shank. Observations indicate the CO_2 has no apparent detrimental effect on the wheel, nor metallurgical effect on the metal. In fact, the wheel appears to have less tendency to load, resulting in fewer dressings,

. . . *Continued on page 158*

Carbide-Tipped Fluteless Drill for Plastics*

by W. H. Dickinson
Headquarters Mfg. Eng., Dept.,
WESTINGHOUSE ELECTRIC CORP.

In the past few years the development of plastics for industrial use has moved at an extremely fast pace. The new plastics which incorporate mineral fillers and special binders have brought about an increasingly difficult job of drilling. The harsh abrasive action of the fillers generally means short life for the cutting tool.

Drilling plastics with spiral drill is slow, hard on drills. New type drill is much faster, better, cheaper.

To overcome this objection and to get an even better drill for the purpose, Mr. Robert Double, Westinghouse Manufacturing Engineer, set about developing a drill specifically for hard or abrasive plastics. In order to get adequate tool life, it was soon determined that it would be necessary to have tungsten carbide tips in the drill. However, he found that flutes such as are found on standard twist drills were a detriment in the drilling of plastics. The flutes continually clogged with chips, thus preventing deep hole drilling unless the drill was frequently withdrawn for chip clearing. As the flutes clogged with chips and gum deposits, the friction of the drill increased considerably and the drill soon overheated. This overheating reduced tool life. Mr. Double decided, therefore, to make a drill without flutes.

After much experimentation it was found that a spade head drill with a shank 40% of the diameter of the nominal hole size produced a drill with optimum qualities. If the shank was smaller than 40% of the drill diameter, it became too weak and twisted off under heavy feeds. If the drill shanks were larger than 40%, it did not allow sufficient clearance for chips.

The resulting drill bit is a piece of preformed tungsten carbide brazed into a slot cut in a minimum amount of supporting tool steel on the end of a relatively small shaft. It was found that the drill could successfully cut plastics and other relatively soft materials such as wood, fiber, at amazing speeds and with very long tool life. Many holes have been

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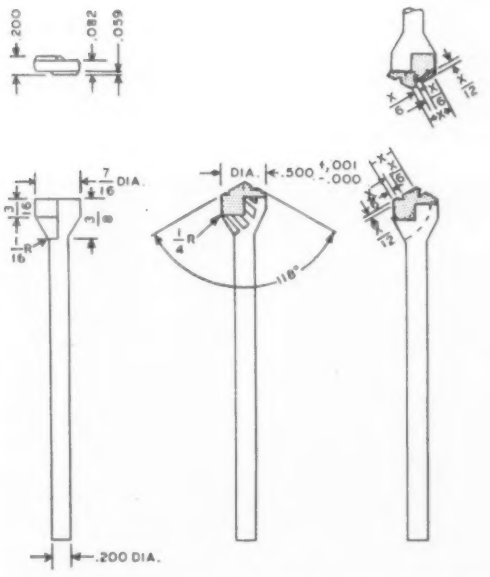

Sketches of typical carbide-tipped drill for plastics. Note— after brazing, cross-hatched section of steel head should be blended to contour of carbide tip for chip flow. Do not remove more stock than necessary .

*From "Maintenance News" a Westinghouse Publication. Our thanks to Westinghouse for permission to pass this information on to our readers. Ed.

AN EVALUATION of Diamond-Substitute Processes

by Francis J. Lennon
General Superintendent
KENNAMETAL, INC.
Latrobe, Pa.

FOR SOME TIME NOW, Kennametal, Inc., along with all of the other industrial diamond bort users in this country, has been very much concerned about the possibilityof not having sufficient industrial diamonds to take care of our production requirements.

The seriousness of the situation was recognized by the National Production Authority when on March 13, 1952, they issued Regulation M-103, which was designed to insure the more efficient use of the available supply of diamond wheels and tools. Whether or not this directive has been effective is subject to question. Irregardless of this, it is a certainty that the regulation will not be sufficient to insure an adequate supply of diamond wheels and tools if our production requirements continue to increase.

Daily there are new and important developments in the application of cemented carbides, requiring increasing quantities of industrial diamonds. At the same time, the supply of industrial diamonds is to be less according to recent reports.

Kennametal has been doing considerable work in an effort to determine whether or not suitable substitutes can be found for diamond grinding. For four years, we have been experimenting with an Ultrasonic Engraving Machine, produced by the Cavitron Equipment Corporation. For the past year we have been running extensive tests on the grinding of Kennametal tools by the electrolytic grinding process. Recently tests have been conducted to determine whether or not any appreciable savings in diamonds could be expected by the use of CO_2 as a coolant. More recently, we have looked into the possibilities of abrasive belt grinding as proposed by Behr-Manning Corporation on the Fenlind Micro-Finish Grinding Machine.

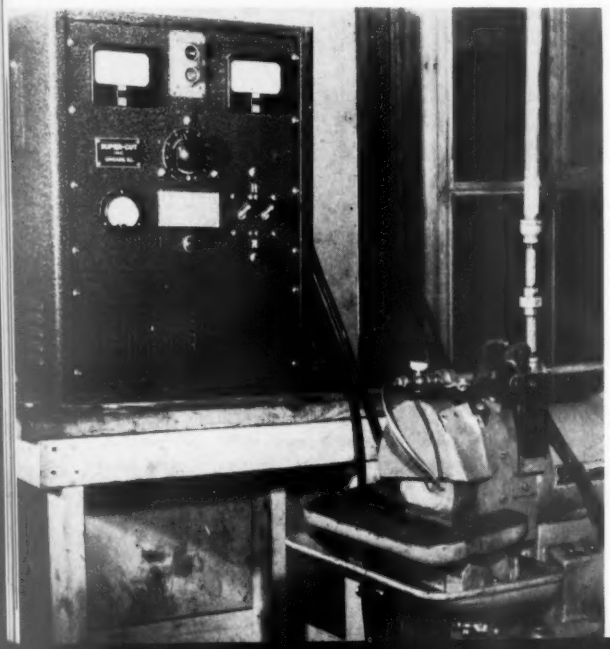

Fig. 1. This setup for electrolytic grinding is being used in an intensive series of tests to determine the best bond for maximum wheel life and minimum diamond consumption.

Almost needless to say, we are also employing accepted methods of efficiently using conventional diamond products. Along with this work, careful attention has been given to the saving and accumulating of all grinding sludge which contains any appreciable amount of diamond residue. This sludge has been sent out to various reclaimers on an experimental setup with the hope of finding someone who can do a satisfactory job of reclaiming the diamonds in the sludge. To date, our best recoveries have been made by the C. W. Danforth Laboratories. However, the main difficulty along these lines has been the lack of capacity in this country to do a complete job of diamond reclamation.

The electrolytic grinding process, which has received the greatest amount of publicity in the past year, has also obtained the greatest amount of our attention. We have devoted considerable time toward investigating the possibilities of this method in serving as a substitute for finish diamond grinding of Kennametal tools. Facilities were set up for carrying on the experimental grinding, using a 100-ampere, 25-volt rectifier in conjunction with a standard offhand grinder using a 6-inch grinding wheel (Fig. 1). The spindle on the grinder required alterations in order to provide proper insulation of the wheel from the machine.

Our purpose in this report is not to provide any technical data on the electrolytic grinding

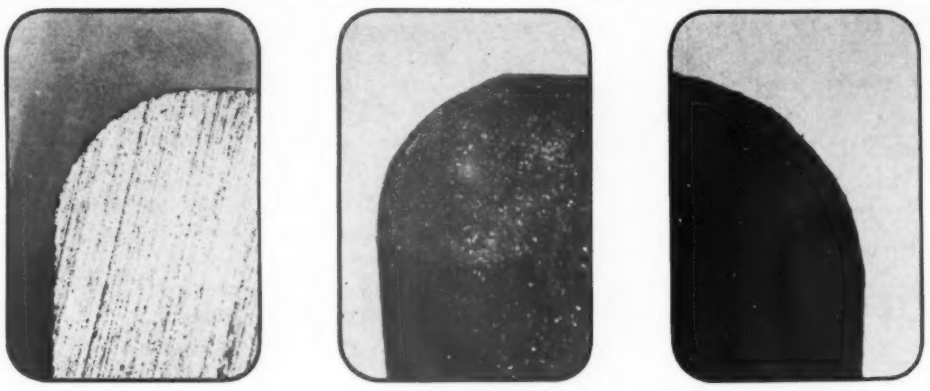

Fig. 2. Photomicrographs of Tool Point at 35X

process, as such, since this has been adequately covered in many excellent articles written in the past year. All of these should be read by anyone interested in doing experimental work along the lines of electrolytic grinding. We are merely endeavoring to report on the results that can be expected from the use of this process.

We have found that a satisfactory cutting edge can be generated on a carbide tool by proper electrolytic grinding methods. There need not be any sacrifice in the quality of the cutting edge if the work is done properly. However, all of the electrolytic grinding that has been done by us still involves the use of a diamond wheel. Theoretically, the diamonds in the wheel act as spacers to provide the proper gap for the electrolytic arc and are not meant to perform a cutting operation. However, it has been determined that thin oxide film is built upon the surface of the carbide and the diamond particles are utilized in scrubbing away this oxide surface. Efforts have been made to use abrasives other than diamonds but to date have met with complete failure.

A great deal of our efforts have been discouraging inasmuch as we have experienced diamond consumption in the electrolytic grinding to be about equal to that of conventional grinding. More recently we have been experiencing better results; and we note results in the recent report by Dr. N. W. Thibault and B. H. Anderson of Norton Company that do indicate a greatly reduced diamond consumption.

Early in our work, we found that a 60-grit diamond wheel performed much better on electrolytic grinding than a 150-grit wheel. No deterioration in the quality of the cutting edge was noted when using the coarser wheel (Fig. 2). We also found that diamond consumption on a ½" wide faced diamond wheel was considerably reduced over that of the ¾" wide faced wheel. In spite of these improvements, there still was sufficient wheel wear taking place to discourage us. It became apparent that the bond in the metal-bond wheel was quite critical, and what actually appeared to be wheel wear was really an attack on the wheel bond itself that was taking place. We are now conducting tests on different bonds in an effort to improve our results. However, it is obvious now that electrolytic grinding cannot be done successfully with any conventional metal-bond wheel. More work is needed along these lines in an effort to determine just what the best bond is for maximum wheel life and minimum diamond consumption.

We have also experienced a terrific rusting problem from the basic salt solution that was

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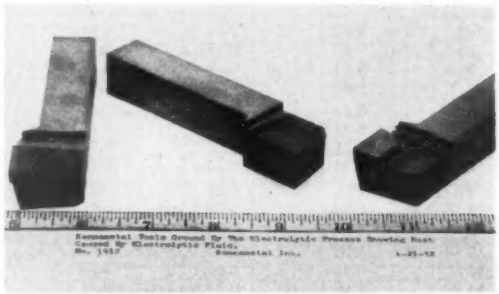

Fig. 3. These Kennametal tools, ground by the electrolytic process, show that the braze material while stained by the electrolyte was not actively attacked.

How to Select

CUTTING TOOL MATERIAL for AUTOMATIC SCREW MACHINE WORK

(Continued)

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Tool Materials

The high speed steels are used more extensively in automatic screw machine work than any other type of tool material. The standard types available, which include both the molybdenum types and the so-called super alloys with cobalt, are listed in Table 2. Regradless of type, the high speed steels have a rather striking similarity.

They possess a high alloy content; they usually contain sufficient carbon to permit hardening to file hardness; they harden so deeply that almost any section encountered commercially should have a uniform hardness from center to surface; they are all hardened from high temperatures, and their rate of transformation is so slow that they can be cooled in still air and be near maximum hardness.

While all high speed steels have many similar properties, nevertheless these properties may be varied over a wide range by changes in chemical composition. The most important is that of cutting ability and the next in importance is that of toughness.

Cutting ability appears to be dependent upon factors which can be named more readily than ranked in importance; these factors being: (a) the ability to resist softening at elevated temperatures; (b) resistance to wear at the operating temperature in that area which is in contact with the work; (c) the toughness; and (d) the hardness. It is difficult to separate these properties one from the other as they all are somewhat inter-related.

The standard 18-4-1 composition, type 9, has been the most frequently used material in the past. However, other types have been developed having superior properties. Thus, the 18-4-2 composition, type 10, is used with

Table 2 High Speed Tool Compositions

Type	Chemical Composition,** Per Cent							
	Carbon	Manganese	Silicon	Chromium	Vanadium	Tungsten	Molybdenum	Cobalt
1	0.85	0.30	0.25	4.00	2.00	.....	8.00	.....
2	0.80	0.30	0.25	4.00	1.00	1.50	8.50	.....
3	0.85	0.30	0.25	4.00	2.00	6.25	5.00	.....
4	1.20	0.30	0.25	4.00	4.00	6.00	4.50	.....
5	0.85	0.30	0.25	4.00	1.00	1.50	8.50	5.00
6	0.85	0.30	0.25	4.00	2.00	1.50	8.50	8.00
7	0.85	0.30	0.25	4.00	2.00	6.25	5.00	5.00
8	0.85	0.30	0.25	4.00	2.00	6.25	5.00	8.00
9	0.70	0.30	0.25	4.00	1.00	18.00	.....	.....
10	0.85	0.30	0.25	4.00	2.00	18.00	0.75	.....
11	1.00	0.30	0.25	4.00	3.00	18.00	.....	.....
12	0.80	0.30	0.25	4.00	2.00	14.00	0.75	5.00
13	0.75	0.30	0.25	4.00	1.00	18.00	0.75	5.00
14	0.80	0.30	0.25	4.00	2.00	18.00	0.75	9.00
15	0.80	0.30	0.25	4.00	2.00	20.00	0.75	12.00
16	1.50	.....	.....	4.75	5.00	12.50	.....	5.00

**Approximate Compositions.

success for any type tool which previously used the 18-4-1 type. Due to the higher carbon content and increases in vanadium, this analysis offers a noticeable increase in wear resistance; this property being valuable for fine cuts taken by reamers, broaches, forming tools and finishing tools.

The analysis indicated by type 11, the 18-4-3 type, has even better wear resistance and is particularly suited to the cutting of hard wrought metals, castings, and soft gummy materials, where both the wear resistance and abrasion resistance of this type can be used to advantage.

Due to the recent shortages of tungsten, which will undoubtedly continue for an indeterminable length of time, the use of the high tungsten high speed steels have been curtailed and emphasis has been placed on the use of the more recent developed molybdenum high speed steels. The type 2 composition was the first of the molybdenum group of high speed steels to establish itself as a general purpose tool material; the composition exhibiting good red hardness and resistance to wear. Type 3 composition has been found satisfactory for all classes of high speed steel applications, and it has proved superior for fine edge tools and for finishing cuts.

The type 1 composition has been found to have 15 to 40 percent better cutting properties than other molybdenum high speed steels and is, at the same time, approximately 15 percent tougher as indicated by the torsion test. This type is particularly useful for fiine edge tools that must be ground to sharp angles, as exemplified by the box tool, where danger of chipping or edge crumbling is pronounced.

The composition of types 4 and 16 differs

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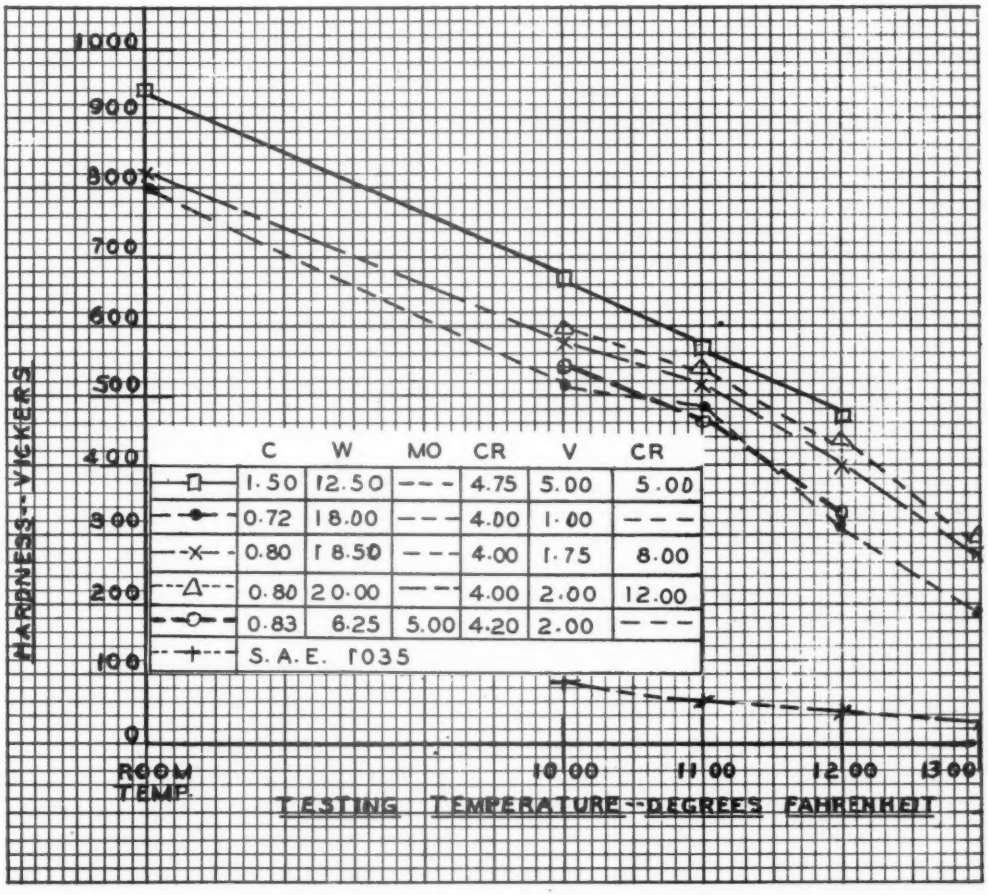

Fig. 1 The degree of red hardness increases somewhat with the increase in content of cobalt and other alloys. This property is comparative as indicated in this chart.

For Carbide Tooling— Your Turret Lathe Needs the Right Size Motor

The application of Carbide tooling to turret lathes usually results in the use of heavier tool feeds and higher spindle speeds. To make this possible, the machine must be adequately powered but not beyond a point which provides safety to the vital parts of the lathe.

This article includes charts to help calculate power requirements for different materials at varying depths of cuts. These charts are invaluable in determining the combinations of cutting operations that will allow the machine to produce at maximum efficiency.

A turret lathe may actually be considered as a power conversion device. Its driving motor receives power from the electric lines and converts it into energy in the form of work done at the tip of the cutting tool. When considered in this way, the machine tool motor itself assumes almost equal importance to the machine, both being dedicated to the job of producing the work piece to the desired shape and size.

Of first importance, then, is the supply of "adequate" driving power together with the shape of cutting tools to remove the greatest volume of metal per unit of energy supplied. "Overpowering" the machine is not desirable because of the unnecessary expense of investment and the possibility of damage to the machine tool through unwarranted power transfer.

To obtain acceptable tool life, carbide tools should be operated at 3 to 4 times the speed of high speed tools and at heavier feeds. However, because carbide tools perform operations similar to high speed tools, it is very easy to overlook the needed increase in power requirements. Some times, it happens the other way around and folks over-estimate the power required. It is the purpose of this article, therefore, to outline some of the factors affecting the choice of motors for turret lathes.

As with the automatic, the turret lathe performs in combination such operations as drilling, turning, forming, threading, etc. Because of this, great variations in power consumption are encountered during the work cycle. This is illustrated by the chart in Figure 1. This chart shows the power input to the motor in the production of the taper stud shown in Figure 2. Operations are identified on the left hand side of the chart; all tools are carbide-tipped. The tooling layout for this part is shown in Figure 3.

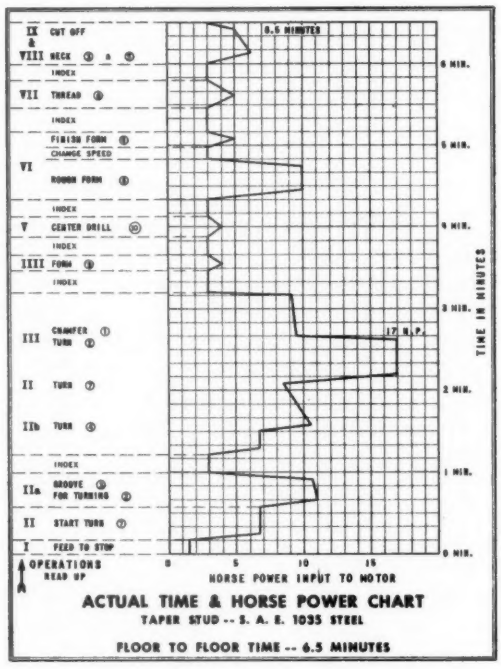

Fig. 1. To record the actual time consumed and the horsepower input to the motor during the machining of a taper stub, this chart was developed. The machining cycle included a combination of drilling, turning, forming, threading and cutoff.

Experience has shown that the average turret lathe job has a power input pattern

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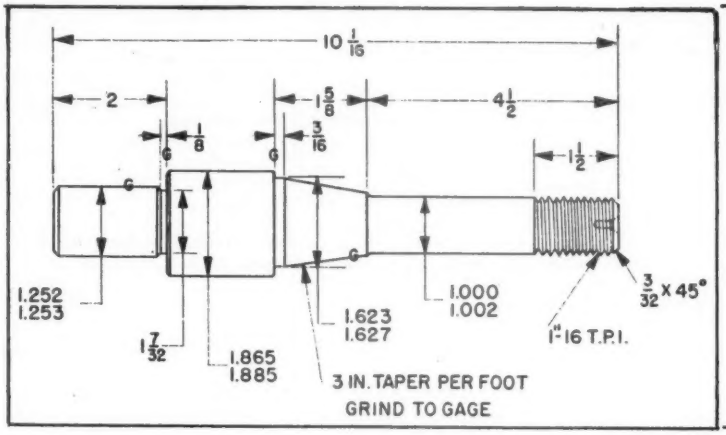

Fig. 2 Five turned diameters, a 3 inch per foot taper, grooving, center drilling, countersinking, chamfering, forming and cutoff are among the machining operations perfomed to produce this taper stud in 6.5 minutes. A high peak of 17 H.P. with an average of 7.8 H.P. was the power input to the motor.

approximately the same as that shown in Figure 1. For this particular job, the high peaks in horsepower are 17, with an average horsepower of 7.8. The ratio between the two is 2.18. Therefore, if a standard motor has the necessary heat capacity, mechanical strength, maximum running torque, and speed regulation, such a motor can be selected with a continuous rating approximating one-half of the peak horsepower required. Since a standard motor does not have such a capacity, a compromise selection must be made.

Obviously, it is impractical for the machine shop operator or tool engineer to calculate the peak and average horsepower for each and every job; first, because it is laborious and second, because the average turret lathe is used for various types of jobs of widely varying power requirements. To eliminate this difficulty, two possible methods of motor selection can be used to cover the average run of turret lathe work. The first method covers applications where the lathe is used for making a wide variety of products of a general class. The chart shown in Figure 4 is used for those jobs classified as standard duty or heavy duty, depending upon the material to be machined, the class of tooling, and type of cutting tools used. It is recommended that this chart be used in conjunction with a list of recommended motor sizes for standard and heavy-duty applications for different sized turret lathes. Such recommendations can be obtained from various turret lathe manufacturers.

The motor size for heavy-duty work is the largest motor that can be used safely on a turret lathe, and the motor for standard duty is usually one size smaller. Unusual jobs expected to require extra heavy-duty motors should be submitted to the turret lathe manufacturer for specific recommendations.

Motor Overloads

Motor overloads are satisfactory if used with common sense. If the heavy cuts which overload the motor are of short duration and comprise only a small percentage of the work

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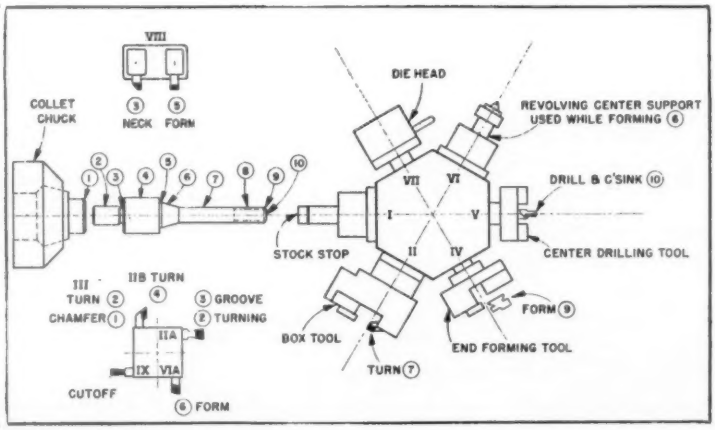
Fig. 3. The carbide tipped tool layout is shown in this sketch. A six station turret carries the end working tools while the chamfer, turning grooving, forming and cutoff tools are mounted on the cross slide turret.



. . . Screw Machine, from page 41

Table 3 Applications of the More Commonly Used High Speed Steels

Type	Approximate Composition*	Application
9	18-4-1	General die and tool work, including fine edge tools.
10	18-4-2	Super steel for fine edge tools and for general shop tool work.
13	18-4-1 + 5 Co	Heavy duty cutting tools.
14	18-4-2 + 9 Co	Heavy duty cutting tools for high production.
15	20-4-2 + 12 Co	Heavy duty cutting tools for high production.
1	x-4-2-8	A molybdenum high speed steel substitute for type 9.
3	6-4-2-5	A molybdenum-tungsten high speed steel substitute for types 9 and 10.
4	6-4-4-5	1.25% Carbon high speed steel for exceptional wear resistance.

*The digits indicate the approximate composition; the numbers represent the percentage of tungsten, chrolum, vanadium and molybdenum in that order.

from the other high speed analyses in that it has both high carbon and high vanadium. Its resistance to abrasion, which is far in excess of most other types of high speed steels, adapts it to all operations involving fine cuts such as broaching and reaming. It also can be used with excellent results for many other types of tools including form cutters, chasers, drills, milling cutters, lathe and planer tools. It is adaptable to all steel cutting operations and increased tool life will be observed, especially when employed in the machining of heat treated steel or those grades generally found difficult to machine.

Due to its high abrasion resistance, any type of tool of this composition will perform very well on such abrasive materials as brass, aluminum, plastics, etc. After the material has been hardened, it is more difficult to grind than the usual high speed steel types; this difficulty usually being overcome by the use of the proper grinding wheel.

The cobalt type of high speed steels, frequently termed the "super high speed" compositions, have come into their own due to the increasing demand for parts machined from the jet engine type alloys. In general, this class of tool materials has higher red hardness than any of the other types previously mentioned; the degree of red hardness increasing somewhat with the increase in content of cobalt and other alloys. This property is placed on a comparative basis as is indicated in Figure 1 and compiled by Leckie-Ewing [4]. These alloys are slightly more brittle than the other types of high speed steels mentioned previously, however they give better performance on hard materials and at high speeds where considerable heat is generated.

A few precautionary measures in the heat treatment of this type of material should be observed. It must be remembered that this class of steel is very susceptible to both carburization and decarburization during heating; the molybdenum high speed steels and those alloys containing cobalt are especially susceptible to decarburization. It is, therefore, necessary to provide suitable protection; one of the more frequent methods employed being the use of a controlled atmosphere provided from an outside source, separate from the heating medium. These furnaces heat more slowly than any other type, however they can be controlled to prevent either scale or "sweat".

Salt bath heating is another approved control method which is considerably more rapid than the above; usually the high temperature heat employed in salt bath hardening is from 25 to 50 degrees lower than that employed in

Table 4 Effect of Multiple Tempering on Physical Properties of Type 9 (18-4-1) High Speed Steel. [10]

	Time at 1050° F.	Hardness Rockwell C	Tensile Strength Modulus of Rupture in Bending	Torsion Impact
	6 minutes	65.1	312,000 lbs.	16
	1 hour	65.7	270,000 lbs.	30
Single	2½ hours	65.0	408,000 lbs.	48
Tempering	5 hours	64.5	376,000 lbs.	48
	24 hours	63.8	.....	39
Multiple Tempering 2½ hours, Cool, 2½ hours at 1050° Fahr.		64.5	454,000 lbs.	63

Table 5 Effect of Interrupted Cooling from the Temper on Type 9 (18-4-1) High Speed Steel. [10]

	Tempered for 2½ hours at 1050° Fahr.	Tempered for 2½ hours at 1050° Fahr. Cooled to 400° Fahr. Held 20 hours Cooled to Room Temperature
Hardness	65 Rockwell 'C'	64 Rockwell 'C'
Tensile Strength (Modulus) of Rupture in Bending)	408,000 lbs. per sq. in.	450,000 lbs. per sq. in.
Elongation	0.07 inches	0.015 inches
Torsion Strength	310,000 lbs. per sq. in.	346,000 lbs. per sq. in.
Torsion Impact	48 ft. lbs.	109 ft. lbs.

furnace equipment. Proper care of salt is a prerequisite since decarburization can be produced if the salts are not kept in proper condition.

Preheating of high speed tools does not always receive the consideration that it deserves. This operation has several purposes, namely; (a) it serves to eliminate the shock of placing cold tools in a hot furnace, thus minimizing the dangers of cracking and warpage; (b) it serves to eliminate cold working stresses ocurring prior to actual hardening; and (c) it offers a beginning for carbide solution and ultimately decreases the time required at high heat. Definite temperatures and procedures used in these operations can be obtained from the producer of the tool steel.

The transformation of retained austenite obtained from a previous hardening treatment occurs in the cooling from the tempering temperature rather than at the tempering temperature. The tempering temperature usually is above 1000 deg. Fahr.; this value varying to some degree with the base analysis of high speed steel employed.

The tempering temperature should be increased slowly to that recommended for the grade of steel involved, in accordance with the final hardness desired. As previously implied, maximum hardness will usually be obtained within the range of 1000 to 1100 degrees Fahr., depending upon the composition and the structure developed in the hardening phase. The temperature from which maximum secondary hardness results may vary as much as 50 degrees Fahr., depending upon the amount of austenite retained in quenching. This accounts to a large degree for the variation in hardness encountered between tools made from the same steel when tempering at the high side of the range. The recommended minimum time at the tempering temperature should be approximately two hours for tools up to one inch in diameter, with a proportional increase for larger sizes.

The use of a double tempering operation, and in some instance the triple tempering operation for the cobalt high speed steels, will definitely increase the toughness and cutting efficiency of high speed tools. In addition, it has been found that alternate heating and cooling will relieve and balance stresses to a greater degree than will holding at a constant temperature. Where grinding or straightening is performed after the first tempering, it is recommended that the item be subjected to an additional tempering operation. Of interest is Table 4 which indicates the effect of multiple tempering on the physical properties of type 9 composition high speed steel (18-4-1), whereas Table 5 indicates the effect of interrupted cooling from the tempering operation on this same type steel.

The cemented carbide compositions can be divided into two general classifications, i.e., those analyses for cutting steel and the other types for cutting non-ferrous materials. Steel, which is strong, tough and ductile, will form a long, almost continuous chip which rubs or tends to seize on the tool face causing face wear or cratering. This material's high density also results in high cutting pressures, and in addition, the harder type may cause both edge and flank wear. In the machining of the non-ferrous materials such as aluminum or magnesium, there is little or no cratering, due to the low cutting pressures usually involved.

A few of the grades of carbides are tabulated (Table 6) along with the usage of each. This chart can be used as a guide; it being a compilation from data obtained from Firth Sterling Steel Inc. [3]. As is indicated, the principal constituent is tungsten carbide (WC) with cobalt (Co) which acts as a binder. The tungsten carbide component imparts wear resistance to the composition; the hardness increasing upon the increase of this component.

. . .*Continued on page 48*

. . . Right Size Motor, from page 43

cycle, then an overload can be used to get the most efficient over-all performance. However, where the heavy overloading cuts are of long duration and comprise the major portion of the work cycle, it is recommended that the rated motor load not be exceeded. If the feeds and speeds indicated for 100% motor load are not available, then another check should be made at the next lowest spindle speed and the next highest feed. This usually results in a closer approximation of the rated motor load.

Tool Life

To obtain the maximum rate of metal removal in the least amount of time, tool feeds, speeds, and depth of cut are very important items and should be considered in the following sequence:

(a) Depth of Cut

(b) Feed

(c) Speed

To increase the rate of metal removal, and yet maintain maximum cutter life, it is recommended that the depth of cut be first increased. If the depth of cut cannot be increased, the next most desirable factor to increase would be feed. The least desirable effect on the cutter life would result if the speed were increased. These charts compiled for determining horsepower requirements are based on ideal conditions of tool shape and tool surface. Little, if any margin of safety is allowed for poor tool condition. The rate at which metal is removed with carbide tools makes it extremely important that cutting tools be closely watched so that the edges may be resharpened before they become too dull. Negative rake angles or dull cutting edges on positive rake tools may require an additional 50% to 75% of power over the same type of tool when properly ground.

All fundamental steps in tool grinding should be closely adhered to in order to produce an efficient tool which allows metal to be removed with the least amount of horsepower. Proper clearances and relief angles, as well as top rake angles, have a great effect on the power required. Honing or lapping the top face of the cutter is also recommended.

Figure 5 is a check chart used for determining the power consumed under various cutting conditions. The chart is set up to incorporate a 15% average loss in horsepower at the tool. For example, a 5 h.p. motor at a 100% motor load is required if 80-10-10 bronze

Material	*Type of Tooling and Recommended Motor Duty*			
	Stellite or High Speed Steel		*Carbides*	
	Drill-Bore-Turn Simple Tooling	*Bar Turner or Equivalent Tooling*	*Drill-Bore-Turn Simple Tooling*	*Bar Turner or Equivalent Tooling*
ALUMINUM, MAGNESIUM AND THEIR LOW TENSILE ALLOYS BRONZE (LOW TENSILE)	STANDARD DUTY	STANDARD DUTY	STANDARD DUTY	HEAVY DUTY
ALUMINUM AND BRONZE HIGH TENSILE ALLOYS	STANDARD DUTY	STANDARD DUTY	HEAVY DUTY	HEAVY DUTY *
BRASS	STANDARD DUTY	STANDARD DUTY	STANDARD DUTY	STANDARD OR HEAVY DUTY
CAST IRON MALLEABLE IRON STEEL (FREE CUTTING)	STANDARD DUTY	STANDARD DUTY	HEAVY DUTY	HEAVY DUTY
STEEL ALLOYS (HIGH TENSILE)	STANDARD DUTY	HEAVY DUTY	HEAVY DUTY	HEAVY DUTY *

* HIGH TENSILE ALLOYS MAY REQUIRE EXTRA HEAVY DUTY MOTORS BECAUSE OF HIGH CUTTING TORQUE REQUIRED. AC MOTORS ON FULL VOLTAGE WILL CARRY APPROXIMATELY 100 PERCENT MOMENTARY OVERLOAD WITHOUT STALLING.

NOTE: REFER TO TURRET LATHE MANUFACTURER FOR RECOMMENDATIONS ON EXTRA HEAVY DUTY APPLICATIONS.

Fig. 4. This chart shows a breakdown of different types of tooling and the recommended motor duty for machining various types of materials. These materials range from low tensile to the high tensile alloys.

Motor Rating	Material	Bronze (80-10-10)	Cast Iron	Screw Stock	SAE-1040 Bh-180	SAE-1020 Bh-137 SAE-4140 Bh-207 SAE-4340 Bh-207-302	52100 Bh-187 SAE-1095 Bh-190	SAE-4140 Bh-429
	Surface Speed Per Minute	600	250	350	300	250	200	200
5 H.P.	DEPTH OF CUT	.187	.187	.187	.187	.187	.187	.187
	FEED PER REV.	.012	.016	.009	.010	.010	.011	.010
7-1/2 H.P.	DEPTH OF CUT	.187	.187	.187	.187	.187	.187	.187
	FEED PER REV.	.020	.027	.014	.016	.016	.019	.017
10 H.P.	DEPTH OF CUT	.250	.250	.250	.250	.250	.250	.250
	FEED PER REV.	.017	.023	.012	.012	.015	.016	.014
15 H.P.	DEPTH OF CUT	.250	.250	.250	.250	.250	.250	.250
	FEED PER REV.	.025	.035	.020	.022	.021	.025	.023
20 H.P.	DEPTH OF CUT	.375	.375	.375	.375	.375	.375	.375
	FEED PER REV.	.020	.035	.017	.019	.021	.023	.021
25 H.P.	DEPTH OF CUT	.375	.375	.375	.375	.375	.375	.375
	FEED PER REV.	.025	.040	.020	.022	.026	.025	.023
40 H.P.	DEPTH OF CUT	.500	.500	.500	.500	.500	.500	.500
	FEED PER REV.	.037	.050	.025	.030	.032	.035	.032

Fig. 5. Note: These feed rates are listed with respect to their equivalent horsepower requirements for the given work materials. Actual feed rates used in a job are also subject to finish, tolerances, work shape and strength of the work piece, among many other production factors.

is machined at 600 surface feet per minute with a .187" depth of cut at a feed of .012" per revolution.

For another method, applied where the turret lathe is used largely for a particular known job, or where the heaviest job of a group is specified, the following steps are necessary:

1. The horsepower for the heaviest cut, or cuts, if combined cuts are taken, is calculated by formulae or published charts.

2. The machine loss in horsepower for the speed being used is added to the horsepower and the sum is multiplied by two-thirds.

3. The next larger size of standard open A.C. motor above the horsepower calculated in step No. 2 is selected as the proper motor to be used on the job.

For totally enclosed, fan cooled motors, or D.C. motors, a factor of four-fifths is used in step No. 2.

This method provides for overloading the open A.C. motor 50% for the heaviest cut, which is usually of short enough duration so that serious overheating of the motor is not encountered. For unusual jobs involving a rapid succession of heavy cuts, or cuts of long duration, the cutting information should be referred to the turret lathe manufacturer for specific recommendations.

Selecting a motor for a specific job, or establishing a set of cutting conditions consisting of speed, feed and depth of cut which come within the horsepower limitations of a given machine tool rests with the accurate determination of power consumed by one or more cuts during the work cycle. It is of utmost importance to have available an accurate means of calculating such power requirements for a wide variety of cutting conditions.

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Industrial News

Albert F. Sperry, one of the country's leading authorities on automatic control of industrial processing, was recently presented with an award by the Industrial Instrument and Regulators Division of the American Society of Mechanical Engineers.

He was cited by the group "for the elements which he added to the mathematical structure of process control; for his aids to operation of complex systems; and for his professional leadership and inspiration to others."

Mr. Sperry is president of Panellit, Inc., Panalarm Products, Inc. and Panascan, Inc., of Chicago. He was the first president of the Instrument Society of America and is active in the ASME.

. . . Screw Machine, from page 45

Both tantalum and titanium carbide (TaC and TiC) may be included in the analysis; these components are usually added to provide crater resistance. There are other compositions that are not listed, and in the event that a problem of choice of carbide should arise, it is suggested that the producers of carbide be consulted.

As had been previously mentioned, the value of a carbide cutting tool is dependent upon the factors encountered in an individual machining operation. The properties of carbide such as wear resistance, hot hardness, crater resistance and strength makes it suitable for innumerable type operations and materials. Thus, a job analysis would consist of the following factors:

(a) The first factor under consideration would be the chemical analysis. Thus, a high alloy material, particularly one with nickel or manganese, would indicate the possibility of work hardening which would call for the use of a more wear resistant carbide grade than that normally employed. Also, where either the lower carbon or alloy steels are to be machined, the nearly continuous chips that would result would necessitate the use of a highly crater resistant carbide grade. In the machining the non-ferrous alloys, a wear resistant grade of carbide is employed.

(b) The second factor would be the physical condition of the material to be machined, i.e., whether it be a casting, forging, weldment or cold drawn bar stock.

(c) The third factor would be the type of heat treatment and resultant hardness of the material to be machined; this indicating the relative machinability and the importance of the combination of strength, crater resistance and wear resistance in the carbide grade to be employed.

In addition, the equipment that is to be employed should be thoroughly analyzed. Thus, a large, non-rigid, low powered, limited speed machine will require the use of a stronger, higher cobalt grade of carbide which has a relatively coarse grain size. With equipment that has been purchased recently and which is of more rigid construction, a harder and more wear resistant carbide grade can be employed. In both automatic and semi-automatic equipment, where several tools are simultaneously engaged in machining the same work-piece, a harder and more wear resistant carbide is usually required as compared to the type tool that would be used on a turret lathe. This is due to the fact that in automatic work higher speeds and finer feeds are generally employed.

Large, well supported and properly designed tools will usually permit the use of a relatively harder and more resistant grade of carbide. Where mechanical holding of carbide is feasible, the next harder grade of car-

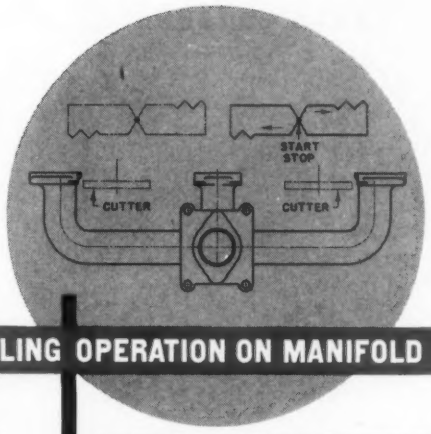
Continued on page 144

Table 6 Composition and Suggested Application of Cemented Carbide Tools (3)

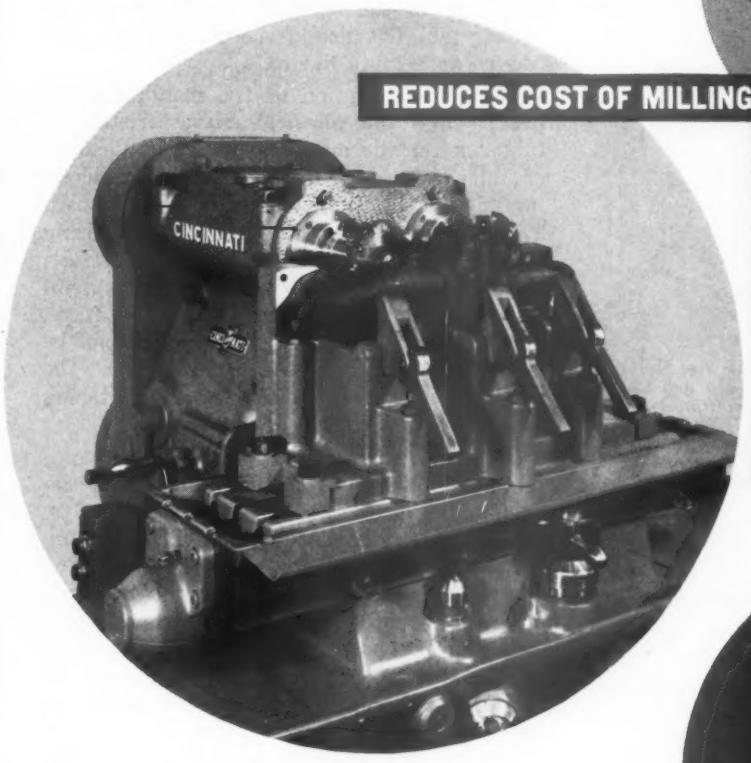
Type	Chemical Composition, Per Cent*				Grain Size	Hardness		Recommended Use
	Co	WC	TaC	TiC		Ra**	Rc***	
1	10.0	85.0	1.0	4.0	Coarse	90.0	75.5	General purpose roughing: slow speeds, deep cuts and heavy feed on softer material. Steels.
2	12.0	59.0	22.0	7.0	Coarse	90.5	76.0	Turning, boring, facing, for general service on low alloy, manganese and the stainless steels.
3	8.0	76.0	.....	16.0	Medium Coarse	91.5	78.5	High speed, fine finishing of hard steel. For low alloy steel.
4	6.5	68.5	.....	25.0	Medium Coarse	92.0	79.0	Precision work of hard steels at highest speeds. Lightest cut and finest feeds.
5	6.25	93.75	.....	.....	Medium Coarse	90.5	76.0	General roughing and wear resistant applications. For copper base alloys and softer non-metallic materials.
6	6.5	90.5	3.0	.....	Medium Fine	91.5	78.0	Non-ferrous for turning, facing, boring and milling. Used also at light cuts, fine feeds and high speeds on high carbon, alloy and stainless steels.
7	4.5	95.5	.....	.....	Fine	92.0	79.5	Light service on copper alloys, aluminum and magnesium alloys. Finishing cuts on abrasive material.
8	3.0	97.0	.....	.....	Fine	92.5	80.0	Precision work on copper alloys, aluminum and magnesium alloys. Used for fine finishing on the hardest, most abrasive materials at lightest steady cuts, finest feeds and highest speeds.

*Approximate **Rockwell 'A' ***Rockwell 'C'

Replacing the overarm with a two-spindle head



REDUCES COST OF MILLING OPERATION ON MANIFOLD



Drawing of part and diagram of automatic cycle.

production data

Part name . . . . . Intake manifold

Material . . . . . Cast iron

Operation . . . . . Mill flanges for stud washers

Depth of cut . . . . $\frac{1}{8}$"

Cutters . . . . . $4\frac{1}{2}$" diameter, inserted blade, sintered carbide

Production . . . . . 125 per hour

Machine . . . . . CINCINNATI No. 1-18 Plain Automatic Milling Machine

CINCINNATI No. 1-18 Plain Automatic Milling Machine. Catalog No. M-1555-2 containing complete specifications will be sent on request.

Multiple spindle milling machines usually save time by milling two or more parts simultaneously. In this example, only one part is milled at a time. However, there are four surfaces and they are milled in pairs. ¶ Cincinnati Application Engineers assigned the job to a CINCINNATI No. 1-18 Plain Automatic Milling Machine. A two-spindle head, driven by the machine, is mounted in the overarm dovetail bearing at the top of the column. A manually operated fixture and two $4\frac{1}{2}$" diameter sintered carbide cutters complete the equipment. This machine, with very little tooling, mills the flanges on manifolds at the rate of 125 per hour. ¶ CINCINNATI No. 1-18 Plain Automatic Milling Machines offer several advantages for work of this type:

(a) Automatic backlash eliminator for down-milling operations, or alternately up and down milling.

(b) Automatic spindle stop protects the operator.

(c) Fast automatic table cycles, with 300" per min. rapid traverse.

Other advantages for production milling operations within a 3 hp range are outlined in Sweet's Catalog File for Mechanical Industries. Complete data may be obtained by writing for catalog No. M-1555-2.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

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CINCINNATI

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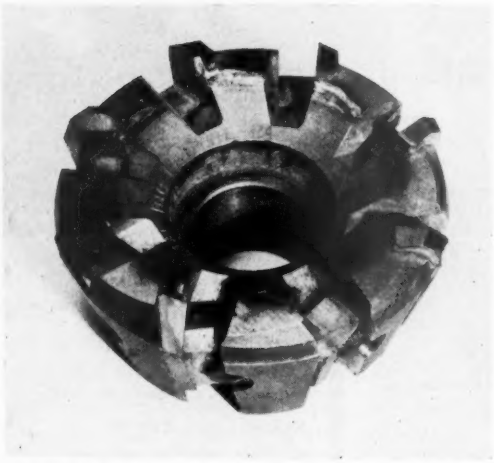
Machining Armor Steel with Tungsten Carbide



Here the depth of cut and amount of feed were both too heavy. This can be seen by these shell end mill blades being completely chipped out, and the soft steel cutter body scored from bearing on the work. Two effective remedies: (1) decreasing depth of cut to 5/16" maximum and reducing feed to .006" chip load per tooth made this cutter useable; (2) the second method involved decreasing the number of teeth, increasing the size of the teeth, and leaving the cut depth and chip load as it was originally. In this instance, original 8-tooth cutter chip load was .008" giving a feed of .064" per revolution. When the number of teeth was decreased to six, maintaining the same chip load of .008" resulted in a feed of .048" per revolution.

The purchase of high cost machine tools and the design and building of jigs and fixtures are required for one thing only, that of applying a comparatively inexpensive cutting tool to a piece of material for the purpose of removing material from that piece in as efficient a manner as possible.

If the cutting tool is such that it does not do its job i.e., is too soft to cut or too brittle and fragile, the use of the finest machine tool and the best designed fixture will not correct the problem; even though each is important and is necessary to reach the end result, i.e., an acceptable part produced cheaply and efficiently.

As modern manufacturing technique improved, it was inevitable that machine tools and cutting tool material and design would also improve. Carbide was one of the materials developed for cutting tools to meet the ever increasing demand for faster and more efficient metal removal. Carbides due to their inherent physical properties offered tremendous possibilities in removing metal cheaply, yet, they also for the same reason offer a challenge to the designer, not only of the cutting tool, but also of the machine tool and fixture or holding device.

by L. H. Snodgrass
Senior Tool Engineer
Cadillac Tank Plant
Cleveland, Ohio

A brief description of the manufacturing process and the physical characteristics of tungsten carbide may help in the application of this super hard material. The principle ingredients are tungsten, carbon and cobalt. The primary element, tungsten has a melting point of almost 7000°F. No retort materials have been perfected to withstand such temperatures on a production basis. To form, mold and compound materials that cannot be melted and mixed in the usual manner, the science of powdered metullargy and sintering is used.

Briefly, this process as applied to the manufacture of tungsten carbide consists of reducing the ingredients to powder form. Carbon and tungsten are placed in carburizing furnaces and heated to about 2700°F. The next step is coating the carburized tungsten or as it is more commonly known, tungsten carbide with powdered cobalt, the bonding agent. Ball milling machines are used for this operation. During the milling cycle, the tungsten carbide is not only coated with cobalt but the grain or partical size is also determined. The partical size helps to determine the "grade" of carbide.

. . . Continued on page 82

An insufficient amount of end relief as denoted by the annular wear on cutter teeth caused this facing cutter breakage. Increasing end relief to 8° remedied the condition and allowed the chip to form freely.

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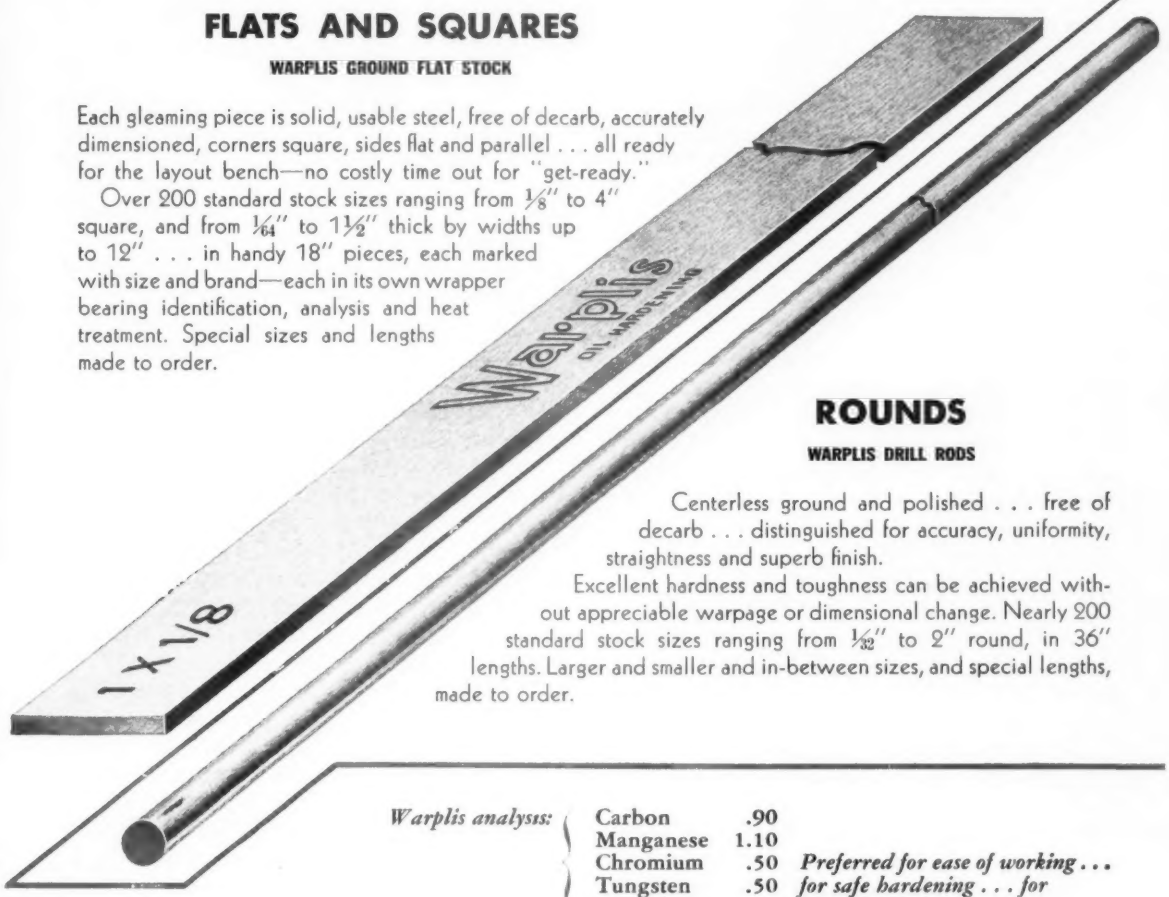

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Warplis analysis:

Carbon	.90
Manganese	1.10
Chromium	.50
Tungsten	.50
Vanadium	.15

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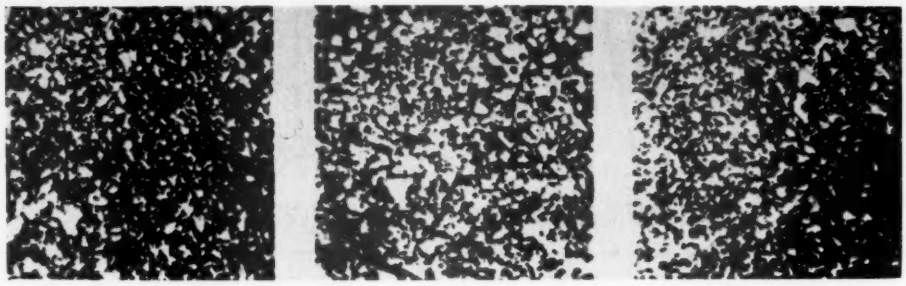
. . . Cemented Carbides, from page 34



Magnification	1000X	1000X	1000X
Cobalt	6%	6%	13%
Aver. Particle Dia.	1.2 mu	1.7 mu	1.7 mu
Hardness - "A"	92.1	91.3	89.5
Transv. Rupt. Strength	257,000	327,000	366,000

Fig. 6. Effect of carbide particle size and binder content.

however, the binder and hard constituent are ballmilled together to obtain the proper size distribution and to provide the optimum contact between the binder and the hard constituent.

Figure 6 shows three commercial cemented carbide compositions which demonstrate the effect of changes in particle size and binder content. These two variables may be adjusted to obtain the combination of physical properties characteristic of an industrial demand. In the frame to the left and in the middle are shown two compositions of the same chemical analysis, namely 94% tungsten carbide and 6% cobalt, but differing in average particle size. The grade in the left frame has an average particle diameter of 1.2 mu, and the middle frame has an average particle diameter of 1.7 mu. The grade with the finer particles is harder and more brittle, but is considerably more wear-resistant, while the coarse particulate system is stronger, more impact-resistant, but has sacrificed some wear resistance. Variation, therefore, in the degree of dispersion, or average particle size, is often more significant than the chemical composition.

While increased wear resistance is an advantage in most applications, the breakage associated with this property is often excessive due to mechanical shock, thermal shock, or faulty brazing. In order to provide strength and thermal shock resistance, either the particle size may be increased or more binder added. The effect of these conditions may be seen in the middle and right-hand frames of Figure 6. The effect of a slight increase in particle size is to increase the thickness of the binder film without too much sacrifice of wear resistance. When impact resistance is required, compromises may be made by adjustments in particle size, binder content or carbide content. Both middle and right-hand compositions have the same particle size, but the cobalt content is 6% in the middle-frame grade and 13% in the right-frame grade.

Figures 7 and 8 show the abnormal growth of the hard particle when bridging occurs around a large particle of cobalt when slightly higher than cementing temperatures are reached. The lake of cobalt formed dissolves the carbide above the cementing temperature, and re-deposits it on preferential atomic planes to produce the comparatively tremendous geometrical crystal.

For each general type of application there are usually three grades compounded which will be suitable for the fine, intermediate and severe machining operations. After the type of material to be cut has been studied, in order to begin with the correct chemical composition, the particle size distribution with the appropriate surface area must be produced by the proper mill size, ball charge, milling vehicle and length of milling time.

While nothing has been said regarding the methods of adding the binder metal to the carbide powders, the importance of this phase of the process should not be minimized. Normally, the binder is added to the carbide powders before milling is begun, to insure that the binder is uniformly distributed throughout the carbide powder mass. The binder may also be predetermined to a definite particle size and stored until ready for use. This, however, necessitates a very efficient and thorough mixing before cementation, to insure

. . . Continued on page 56

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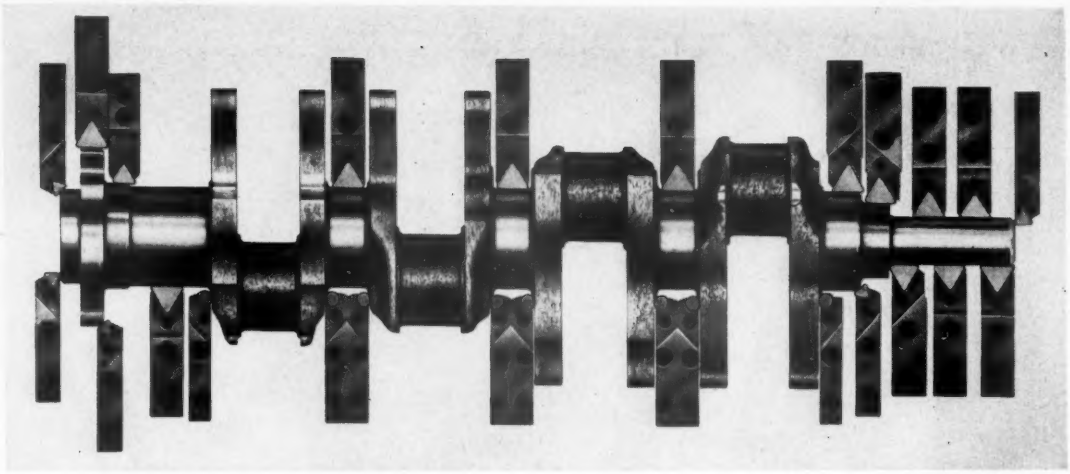

Fig. 1. Layout of carbide insert tools in front and rear slides for machining new type of shell-molded automotive crankshafts. Checking tools in cradle (over-arm) not shown.

Carbide Inserts in Crankshaft Tooling

With the introduction of the new automotive crankshafts made of precision shell-molded nodular (cast) iron, it is now possible to successfully apply cemented tungsten carbide tools of the Index-Insert Type, cutting with negative rakes.

The conventional forged steel crankshaft was, and still is, a difficult and costly problem from a machining standpoint. The application of tungsten carbide tools, in most cases, was successful only to a minor degree. Shell-molded parts are more accurate and have smoother surfaces, consequently require less machining.

Crankshafts for the latest models of automotive high compression engines are more difficult to forge. On the other hand, by use of the newer high-tensile strength ductile irons they are more adaptable to the shell-molding process. In view of the greatly reduced machining time alone, shell-molded parts are extremely economical and the shell-molding process is finding an ever increasing field in American industry.

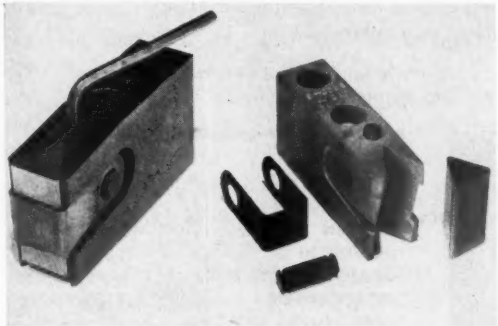

Fig. 2. Typical Multicut insert tool holder, assembled and disassembled. Insert design permits indexing from one cutting edge to another, at each end, before ultimate removal from machine for regrind.

Now in use at one plant are automatic center-drive crankshaft lathes of the Le Blond and Wickes type. These are single spindle, single or double center drive lathes for rough and finish turning all (5) line bearings, flange and stub-ends of crankshafts (Fig. 1).

The typical machine is equipped with a 2-speed motor producing 25 hp at 600 rpm and 50 hp at 1200 rpm. The spindle speed has a low of 65 rpm and a high of 130 rpm. The coolant used is soda water from a central system. The tail stock is hydraulically operated; loading and unloading is fully automatic. A power operated clamping or chucking mechanism is employed. The crankshaft is located from positive-milled driving pads. An hydraulic braking motor stops rotation of the central drive ring gears in a predetermined position to facilitate loading and unloading of crankshaft.

Three separate tool units consisting of front bar, rear bar, and cradle are fully synchronized. The cradle carries all checking tools .025" ahead of the front and rear bar units. All tools located in the front and rear bar, or front and rear slide, are spaced so that the tools overlap each other to finish machine the main bearings No. 1, 2, 3, 4, and 5, plus plunge

. . . Continued on page 58

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

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Capacities from #8 to 4¼"

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Stationary and Revolving. Capacities from #4 to 2"

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J&L DIE HEAD DIVISION

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. . . Cemented Carbides, from page 52

intimate carbide-binder contact. There are also many chemical precipitation and coating methods which have been tried, but the simultaneous mixing and milling of the binder metal and carbide powder produces the most consistent results.

Lubrication and Storing

After the powder is taken from the ball mill, it is usually pyrophoric and must becarefully stored to prevent spontaneous combustion. It may, for example, be stored under an inert gas or the particle surfaces covered with a coating material to exclude oxygen. Very often the coating material serves a dual purpose by also providing lubricating action to permit free movement of the powder particles in the die during pressing. If the lubricant is not added before storing, it may be added just prior to pressing. It is, however, especially important to lubricate powders from which special shapes are to be pressed or those in which the ratio of length to diameter is great.

The disadvantage of adding these coating materials, however, is that it becomes necessary to give the compacts, pressed in this way, an extra heat treatment, in a separate furnace, to remove them. Furthermore, this preheating operation often is the cause of defects in the finished compact. For example, if the preheating rate is too great, the lubricant is volatilized so rapidly that voids and cracks may be left in the compact which do not "heal" during cementing.

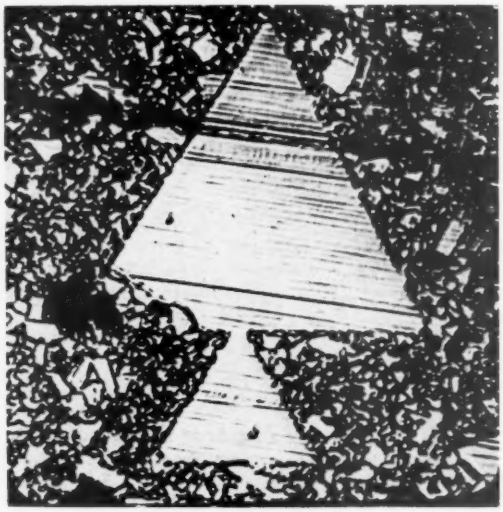
These addition agents, unfortunately, are usually carbonaceous materials, which, upon volatilization, may also react with the carbide materials and alter the composition of the final product. In spite of all these disadvantages, the production of a coherent compact would be very difficult and, in some cases, impossible without them.

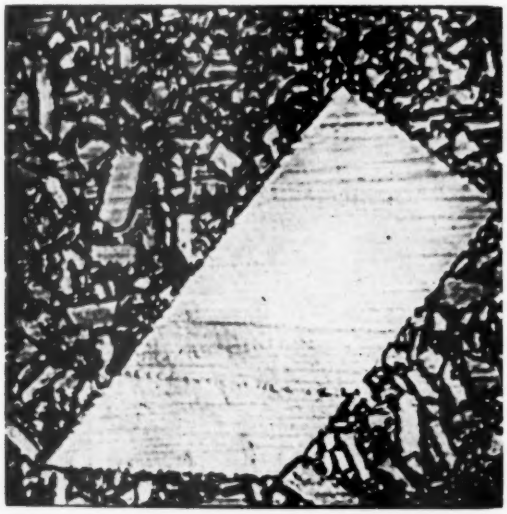
Pressing

The finished mixed carbide-binder powders are pressed into the desirable shape by various methods, which are considered to be the most economical and designed to provide the best combination of properties in the finished product. There are three principal methods used; namely, cold pressing, hot pressing, and extrusion. Another, but more uncommon method, involves the use of extremely high hydrostatic pressures. Shapes of sufficiently simple symmetry and design may be pressed in this manner to produce a more dense as-pressed compact which responds to the cementing process more quickly and does not shrink to any great extent. Hydrostatic pressing is done by placing the lightly pressed and shaped compact into rubber or plastic bags, which are then tightly closed and placed into an armoured cylinder which is filled with a liquid. Pressure is applied to the liquid through the movement of a small ram in an aperture in the center of the cylinder end.

Cold pressing is the conventional method of placing the powder in the die cavity, pressing to the desired pressure, followed by cementation. Figure 9 shows a typical cold-powder press which is capable of high production automatic pressing of simple shapes. Figure

. . . Continued on page 60





Figs. 7 and 8. Abnormal crystal growth resulting from excessive temperatures in manufacture.

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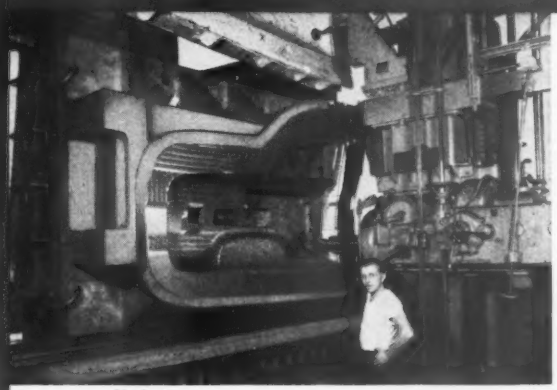
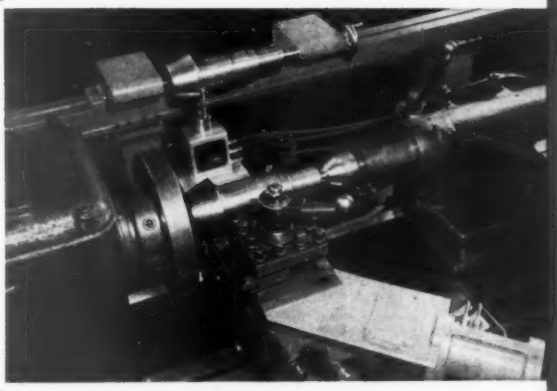


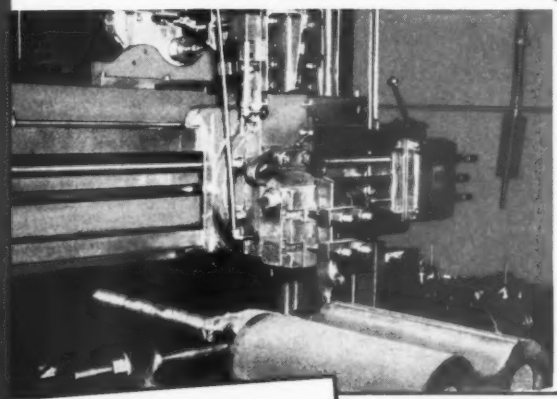
MILLING

The Turchan Follower attachment will transform those difficult tasks to simple push-button operation on your standard horizontal or vertical millers. Irregular profiles and contours; machining of dies, forms and moulds are achieved automatically. Hydraulically controlled cutting tools reproduce directly in metal, the exact dimensions of the model or template. No costly form tools or skilled help necessary. Close accuracies and extremely fine surface finish are cost-cutting features that save rejects. Turchan users report savings of 80% to 600% over old methods.

TURNING

Thousands of lathes in shops all over America, are increasing efficiency and speeding production with Turchan duplicators. The single attachment is pictured machining a stepped shaft. The Turchan replaces the regular cross slide; operates at 45° angle, taking uninterrupted cuts over the work. Square or tapered shoulders, radii, grooves, bevels and undercuts, as well as facing, are all taken in stride to accuracies of .001". There is also a Turchan *dual* 45° lathe attachment which actually doubles tool approach to the work. Any size or make of conventional lathe can be Turchan equipped.





PLANING

Standard planers equipped with the Turchan will duplicate irregular shapes, such as this blower section as readily as straight work. Contours are obtained automatically, with precision results. After job set-up, which is greatly simplified with the Turchan, little more than loading and unloading the work need be done. Once again skilled help is not required, yet production multiplies rapidly. Turchan Followers are also available for ordinary shapers and grinders. The attachment in no way interferes with the conventional controls of the machine tool. "Turn to Turchan to cut cost."

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to your
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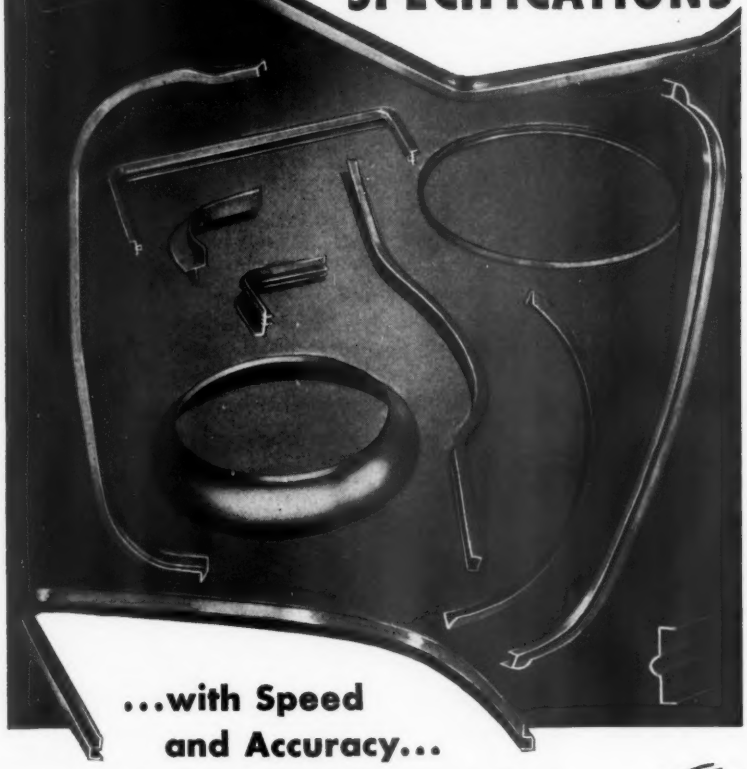

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THE CYRIL BATH COMPANY
Manufacturers of Metal Forming Machinery
6933 MACHINERY AVENUE • CLEVELAND 3, OHIO

. . . Crankshaft Tooling from page 54

turning the O.D., facing both sides of the fly-wheel flange, and facing the #1 main bearing and turning the space diameter. In addition, the stub-end is plunge turned and chamfered. Tooling in the front and rear bars, which operate simultaneously, are shown in Figure 1. The checking tools in the cradle are not shown.

Automatic Work Cycle

The automatically controlled machine cycle is staged as follows:

1. Rapid Approach to cutting position
2. Checking Feed: .125″/rev. (1-3/8″ long) Up to flange diameter
3. Intermediate Feed: .035″/-rev. (1-1/16″ long)
4. Finish Turning Feed: .006″/rev. (.100″ long) When all tools are engaged in plunge turning
5. Diameter Stop
6. Tools dwell at the finished diameter for 5 to 6 revolutions to clean up the cut.
7. Return to a predetermined position for loading and unloading cranks

Cutting Cycle Time—40 seconds

Tool Design

The first experiment with Wesson Multicut (band-type) holders and Wessonmetal carbide inserts was with the "block" type holder, combining as many as five inserts in one tool holder. Proper spacing of the tools was built into the tool holder itself. The locking device and holding mechanism on each tool were of the standard band-type design. The adjustment screws were built into the lower part of the tool holder and the set-up gages incorporated into the holder in proper relation to the centerline of the crank.

Performance of this type of tooling was very successful, with the following tool life reported:

. . . Continued on page 165

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Miller AIR CYLINDERS

ARD
HROME PLATED
ISTON RODS
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APS and MOUNTINGS
liminate Breakage

RASS BARRELS
liminate Rust and Corrosion

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Our normal delivery is now 6 to 8 weeks or longer whenever possible. However, we can make occasional deliveries to meet your RUSH cylinder requirements as follows:

Standard Models except as noted below	**4-5 weeks**
Models 81 and 82	**6-7 weeks**
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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

. . . Cemented Carbides, from page 56

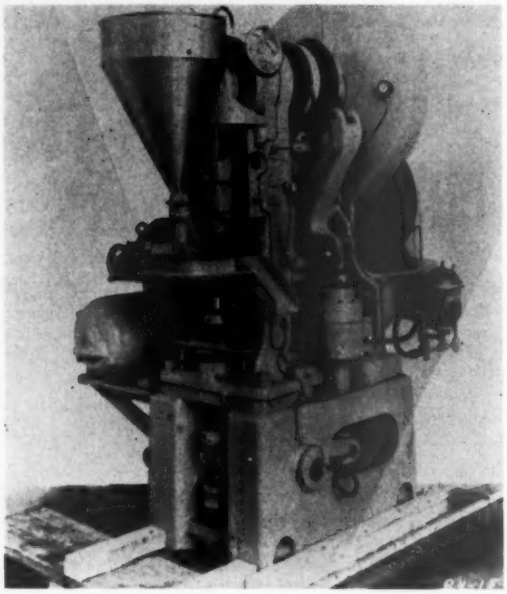


Fig. 9. Cold-powder press for automatic pressing of simple shapes.

10 shows the cycles involved in this operation, and Figure 11 shows some typical die assemblies to produce certain common industrial tool bits.

Hot-powder pressing assemblies are usually specially built for a specific product. While the most pressing done by this method has been done in multi-cavity single molds, which must be destroyed to remove the product, there have been automatic assemblies designed which have been capable of producing

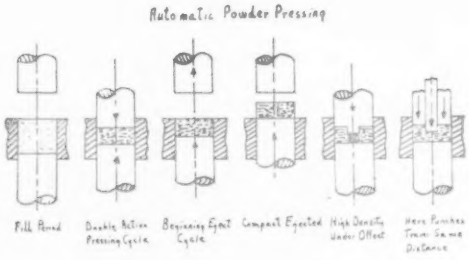


Fig. 10. Stages in automatic cold-pressing operation.

quite a number of parts before the die or die liner has to be replaced. The heat for the operation is obtained in a number of ways, all of which seem to have some particular advantage. A very satisfactory method is one in which the individual die rams are also electrical terminal posts which permit passage of current through the lightly pressed compact. Another method shown in Figure 12 utilizes a high frequency current as a source of heat. With this arrangement only the conducting materials are heated, which has many obvious advantages in time and improved heat transfer, but, unfortunately, the additional time necessary for assembling and dismantling the equipment for each pressing makes it practical for only those parts which cannot be made by the conventional methods.

Figure 13 shows the nozzle used in the extrusion method and a few representative shapes which can be made in this way. It is being used very effectively in the production of tubes, rods, spirals and shapes of more complicated cross-section. A special advantage lies in the fact that extremely small diameter tubes, rods, etc., can be made quite easily.

Cementation

The kinetics or rate processes of the cementation reaction are a complex mechanism that is dependent upon the particle size distribution of the carbide, its available surface and the amount and the efficiency of distribution of the binder metal, the pressing pressure (interparticle contact), the particular chemical equilibrium attained by the hydrogen atmosphere, and the duration and temperature of the operation. If the dew-point of the hydrogen is too high, or the metal binder is excessively oxidized, some decarburization of the carbide will occur, and thus will release sufficient metal from the carbide to cause a serious change in the composition of the binder. This change in binder composition, especially in grades containing small percentages, will seriously affect the strength, hardness and thermal conductivity of the finished compact.

If the available surface area of the powdered carbide is much greater than specified,

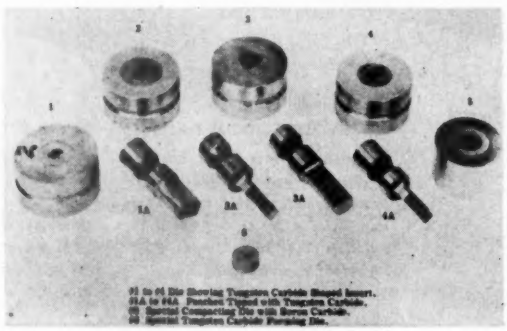
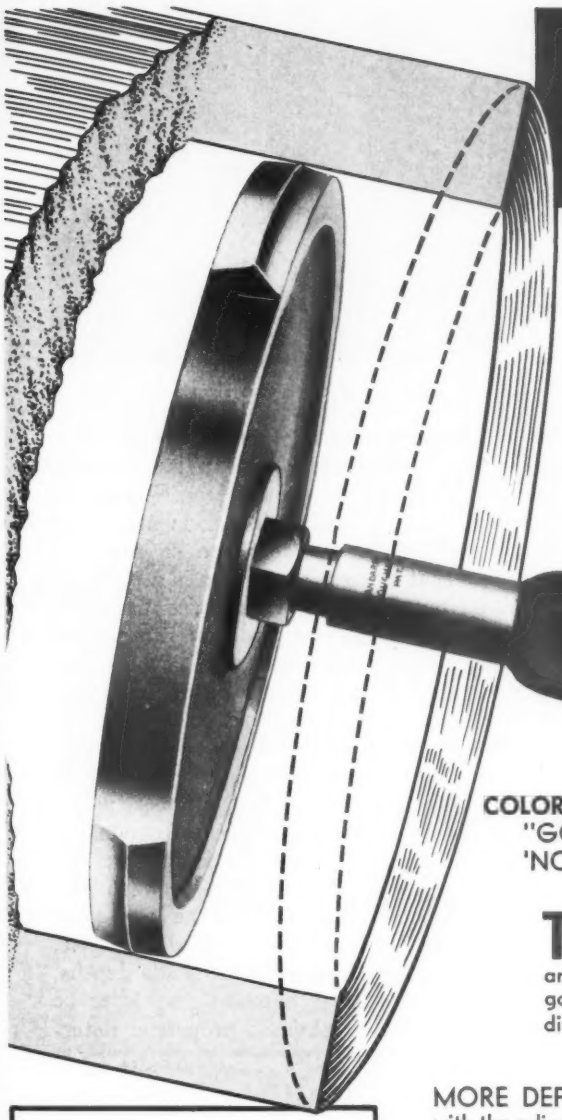


Fig. 11. Typical punches and dies used in cold pressing the mixed powders into a compact of approximate finished shape. The press (Fig. 9), in which these die assemblies are used, is capable of high production automatic pressing of simple shape.



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DuBo* Plug Gages

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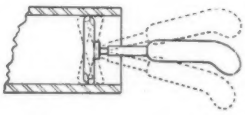
COLOR FLASH HANDLES
"GO" — GREEN
'NO GO" — Red

THE VALUE of a gage is "what it tells", "how well" and "how easily". If the job at hand calls for fixed limit gages, DuBo Plug Gages will give you the best value in dimensional control. DuBo tells MORE, MORE EASILY.



Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!

MORE DEFINITE CHECK There is no uncertainty with DuBo as with the cylindrical type gage, whether the hole is smaller than the plug, or larger and merely close. DuBo not only checks dimensional accuracy but also reveals taper and out-of-roundness. DuBo reduces the number of parts needlessly rejected or improperly passed.

EASIER OPERATION The DuBo Plug Gage weighs from 70 to 80% less than cylindrical plug gages of the same dimension. It is self-piloting, no trouble at all to enter. A "feather touch" is all that is needed for operation. See diagram at left.

LONGER LIFE Gaging surfaces of the DuBo contact the bore walls only at the instant of making the check. DuBo gives you effective, economical gaging.

Double end DuBo Plug Gages Under 1.510"

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the binder metal thickness will be dangerously thin and the product will be brittle. Also, if the binder metal is not efficiently distributed there may be areas in which no binder occurs, with the result that the metal will disintegrate very rapidly in this area under operating conditions.

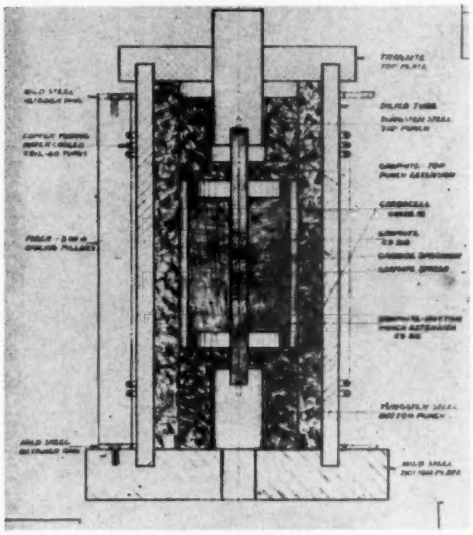


Fig. 12. High-frequency, hot-pressing assembly.

Process Control

The control necessary to maintain a uniform product in the cemented carbide processing is quite elaborate, as shown in Figure 14. Particle size determinations are made on the raw powders and after comminution. Several well-known methods are used. Actual microscopic measurement and count is usually too tedious, but quite accurate for the larger

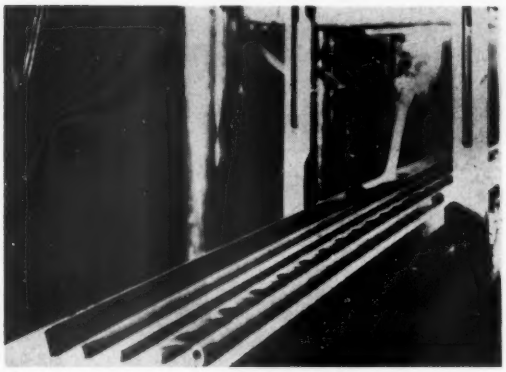


Fig. 13. Extrusion of continuous shapes.

sizes. Sedimentation methods using the Turbidimeter, Andreason Pipette, Wintrobe tube and the Photelometer are common. Air elutriation, using a special classifier is also used, but most carbide powders are so fine and "sticky" that efficient dispersion is a problem. It is obvious that determinations based on settling rates must be made on the carbide and cobalt powders separately, rather than on the milled blend; otherwise, an error due to density variations is introduced.

Before using the powders in the automatic presses, tests are made to determine their pressed densities. Small test samples, which can be easily measured, are pressed at various pressures, and their densities computed from their dimensions. The relation between this density and that obtained with the loose powder is referred to as its compression ratio. This figure is used for computing die depths. These pressed density samples may later be cemented and their physical properties determined.

. . . Continued on page 140

Processing Control Tests (N-6% Cobalt)

Pressure (tons/sq. in.)	Pressed Density	Shrinkage Linear	Shrinkage Volumetric
5	8.09	18.4	45.8
10	8.54	17.0	42.6
15	8.73	16.0	41.5
20	8.88	16.1	40.6
25	9.00	15.6	39.8
30	9.12	15.1	38.8

Carbon Analysis { Total Carbon / Free Carbon

Particle Size Distribution and Specific Surface—188 sq. cen/grm average

Hardness Limits—90.0-91.0 Ra

Density Limits—14.75-14.95 g/cc

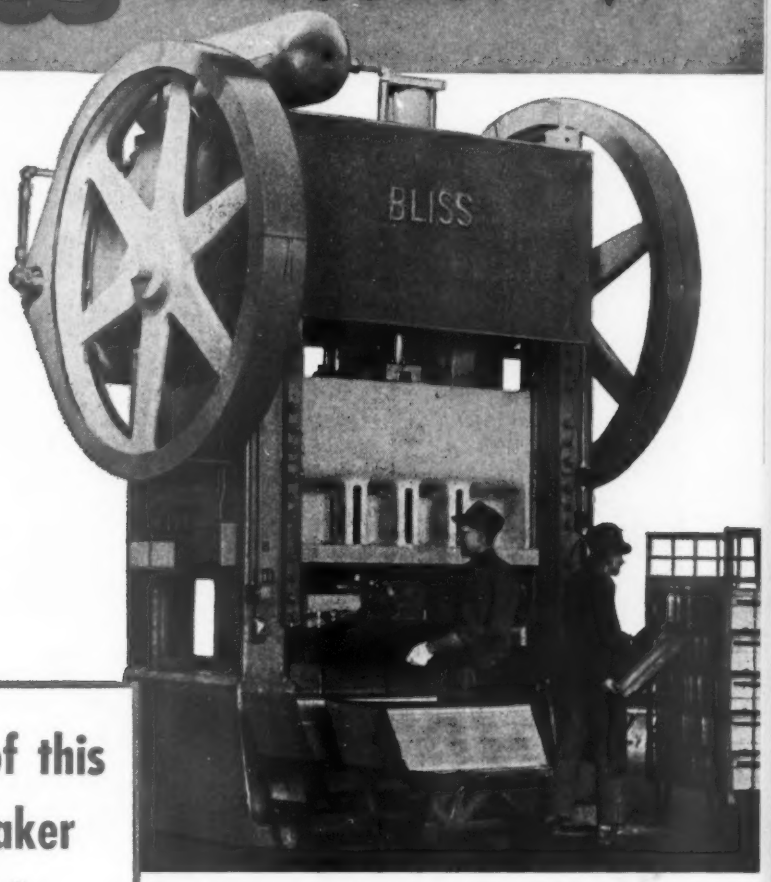
Sintering Temp.—1460-1465°C—1 hr.

Transverse Strength—180,000-250,000 psi (.5625" span)

Fig. 14. Processing controls necessary to maintain uniformity of a typical cemented carbide.

The trend is to more stampings

WITH BLISS PRESSES...



95% of presses of this leading desk maker are Bliss-Built!

NEW 250-TON PRESS is typical of modern Bliss installations at Corry-Jamestown Mfg. Corp. This straight-side press features a sturdy box-frame construction and extra-long slide adjustment.

When it comes to making steel office desks and files, Corry-Jamestown Mfg. Corp., Corry, Pa., is an acknowledged leader. And when it comes to choosing press equipment, Corry naturally turns to the leader in the press field—Bliss.

Throughout Corry-Jamestown's three plants, 95% of the presses are *Bliss-Built*. And in its newest plant, *100%* of the presses over 10-ton capacity are *Bliss-Built*.

Rugged Bliss Straight-Side and Inclinable Presses have helped Corry maintain high quality, speed production, and minimize costs of stampings for its "STEEL AGE" desks and files.

Your local Bliss sales engineer—the trained representative of the world's largest press builder—can show you why Bliss belongs in *your* press room. Remember, Bliss can supply the right press for a given job or a complete press room.

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PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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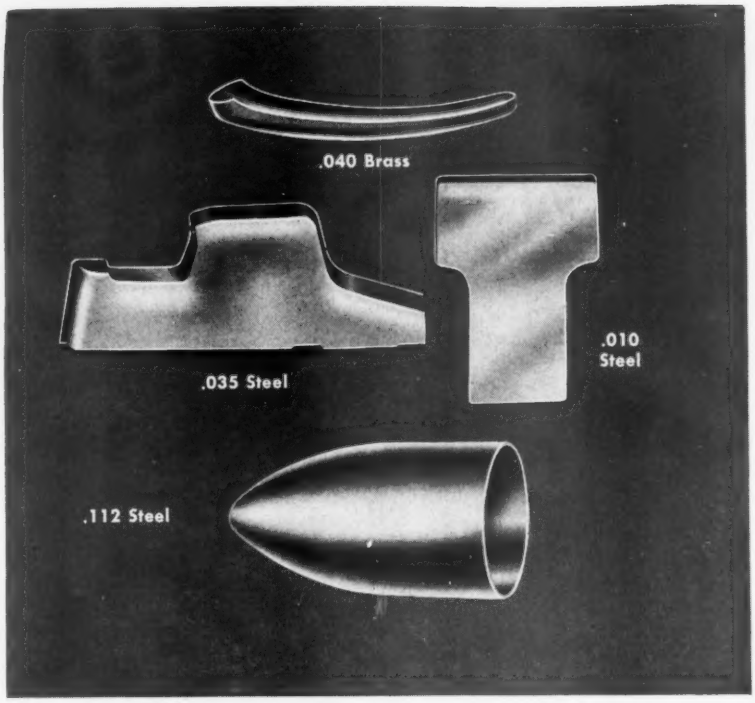

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TRIMS SHELLS COMPLETE
Increase output... reduce costs!

Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness—clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials**—gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber, plastics, or what did you have in mind? **Quantities vary**—stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1200 per hour. **Shapes**—fountain-pen ferrules, artillery cases, watch cases, burial vaults, automotive, kitchen, radio and television accessories and parts. Almost anything *you* need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations are eliminated.

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Large Capacity Drilling and Tapping Machine

The principle of the Burgmaster drilling and tapping machine is now recognized throughout industry, and as a result of the highly satisfactory performance of the present six spindle machine, a new 8-spindle, automatic, hydraulic machine was designed to meet the ever increasing demand for a larger drilling and tapping machine.

Through the experience accumulated during the past 10 years in designing and tapping machines, this manufacturer has incorporated in the latest model all of its valuable experience and

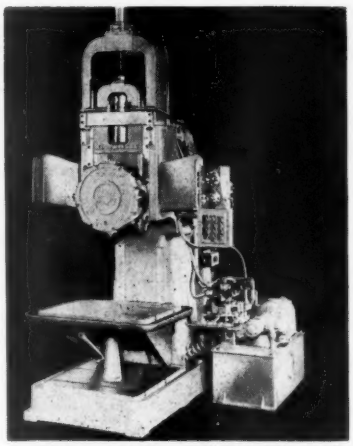

Photo courtesy Burg Tool Manufacturing Co.

research into a most highly satisfactory large capacity machine with such features as rigidity of castings, husky rigid spindles; precision, heavy duty bearings; extreme accuracy in relation between spindles, head travel, and table travel; simple set-up; adequate power; simple electric and hydraulic controls; large throat clearance and table area; long spindle travel; economy of floor space; and minimum maintenance.

Specifications include these features: 8 spindles; 1¼" drill capacity in mild steel; 12" spindle and head travel; 19" table travel; 17½" throat clearance; table work surface—36" wide by 35" deep, with "T" slots; 10 H.P. 2 speed

. . . *Continued on page 77*

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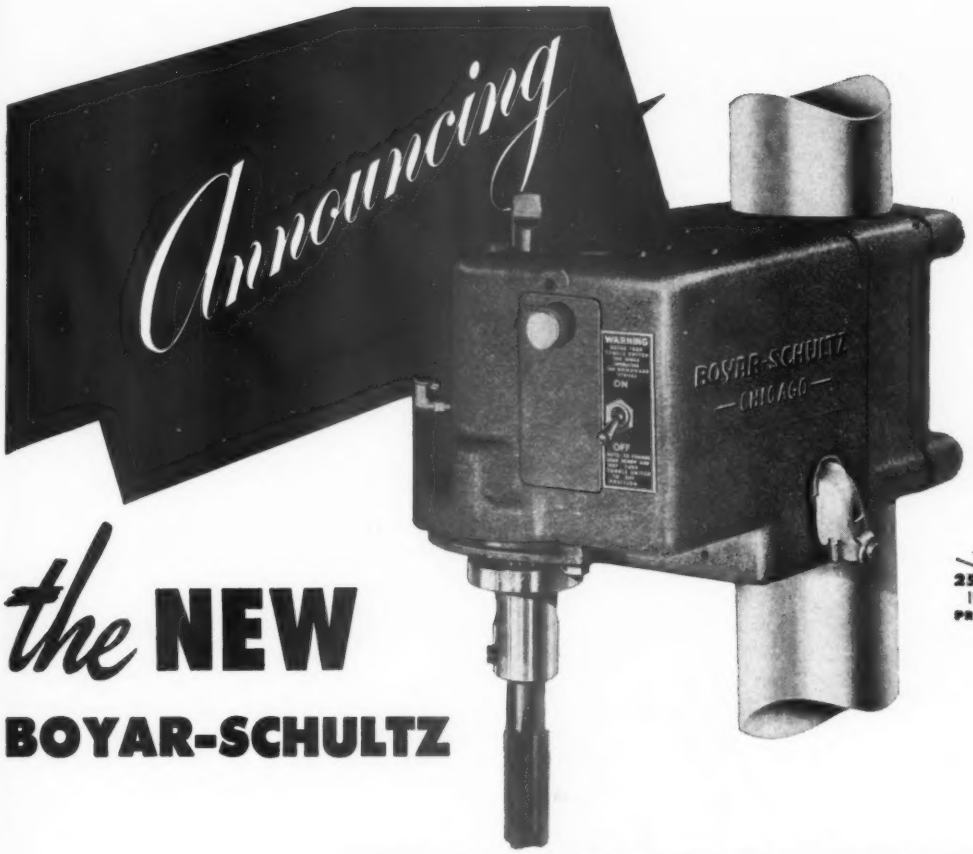

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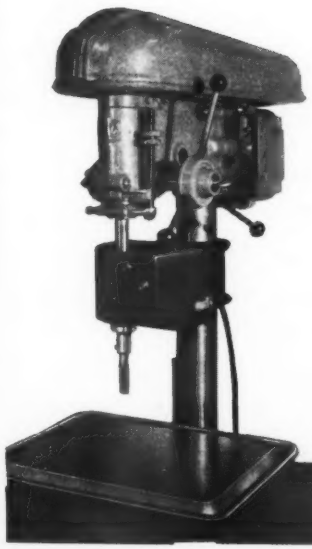
25 YEARS SERVICE 1928 IN 1953 PRECISION MANUFACTURE

LEAD SCREW TAPPING HEAD

Change Your Ordinary Drill Press To a Precision Tapping Instrument in Minutes



Quickly and easily fitted to your drill press, it makes an efficient Tapping Attachment that can produce any thread including Class 4.

No special skill required for operation. Anyone familiar with a drill press can consistently produce accurate threads.

Foot control switch leaves hands free for loading work. Built in reversing switch actuates drill press motor, eliminating need for any intermediate reversing device.

Long, trouble-free life of bronze nut and ground thread Lead Screw is assured, because of their generous 1¾" diameters.

Extreme accuracy in control of tapped hole depth is assured by electrically controlled reversing switches.

All taps up to ⅞" diameter usable with standard adapter bushings. Adapters for taps from $\frac{15}{16}$" to 2" available on special order.

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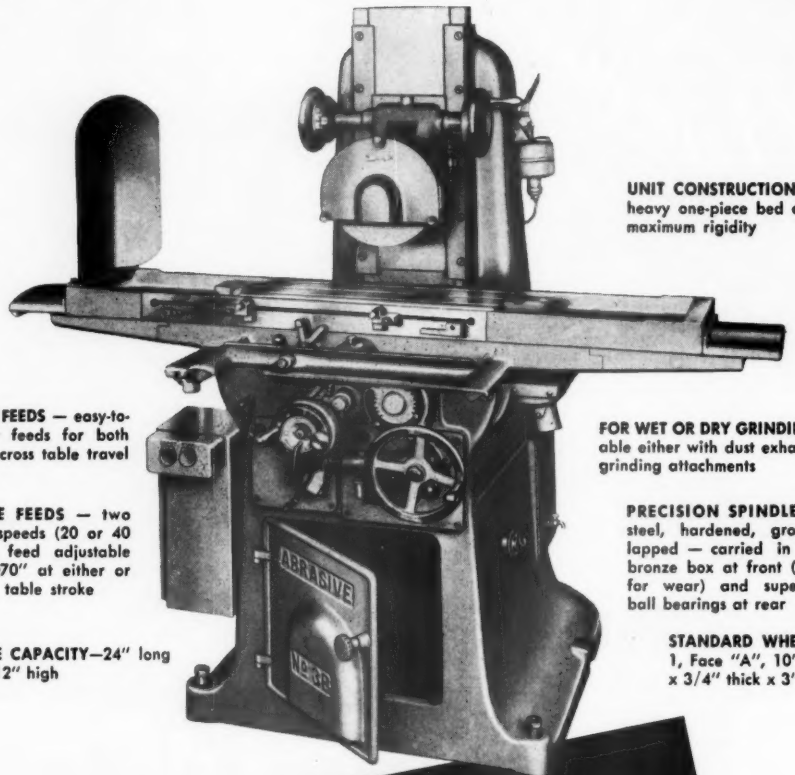

UNIT CONSTRUCTION — extra heavy one-piece bed casting for maximum rigidity

AUTOMATIC FEEDS — easy-to-adjust power feeds for both traverse and cross table travel

ADJUSTABLE FEEDS — two longitudinal speeds (20 or 40 fpm) — cross feed adjustable from 0 to .070" at either or both ends of table stroke

WIDE RANGE CAPACITY—24" long x 8" wide x 12" high

FOR WET OR DRY GRINDING—available either with dust exhaust or wet grinding attachments

PRECISION SPINDLE — alloy steel, hardened, ground, and lapped — carried in phosphor bronze box at front (adjustable for wear) and super-precision ball bearings at rear

STANDARD WHEEL — Type 1, Face "A", 10" diameter x 3/4" thick x 3" hole

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Next time you're in the market for a production or toolroom grinder, take a look at the Abrasive No. 3B. From every angle — productivity, precision, ability to produce fine finishes — this grinder gives you the kind of output you need. Write today for complete illustrated catalog. Abrasive Machine Tool Co., 16 Dunellen Road, East Providence 14, R. I.

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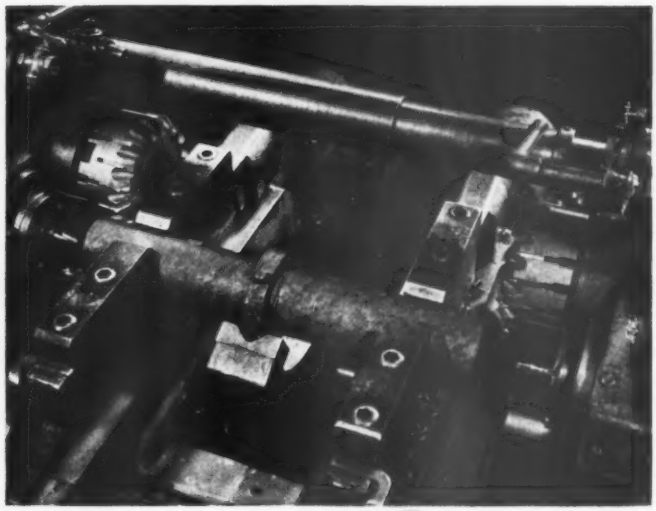

150% INCREASE IN OUTPUT
PER DOLLAR SPENT FOR
WESSON TOOLING

COMPLETE PRODUCTION STORY ON THE CATERPILLAR TRACK ROLLER SHAFT

Machine	Fay automatic lathe
Part Machined	Track roller shaft
Operation	Milling and centering
Material	1046 steel
Tools	6¾" dia. Wesson Rigidcut Milling Cutter—18 blades
Speed	320 S.F.M.
Depth of Cut	¼" to 7/16"
Feed	15" per min.
Feed per Tooth	.005"
Feed on Center Drill	.006"
Production	400 pcs. per grind. 50 pcs. per hour
Grade of Carbide	Wessonmetal WH

OLD METHOD	WESSON ENGINEERED METHOD
Pieces Per Grind.....166	Pieces Per Grind.....400
Tool Cost Per Piece...$0.0716	Tool Cost Per Piece..$0.0285
Grinding Hours Per Year.....420	Grinding Hours Per Year.....183.33

ON 1 JOB WITH 1 WESSON TOOL
SAVINGS OF OVER $2400.00
PER YEAR

WESSON METAL CORPORATION
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Affiliated with WESSON COMPANY, Detroit, Mich.

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CARBIDE INSERTS
in
DIE STRIPPERS
and
STOCK GUIDES

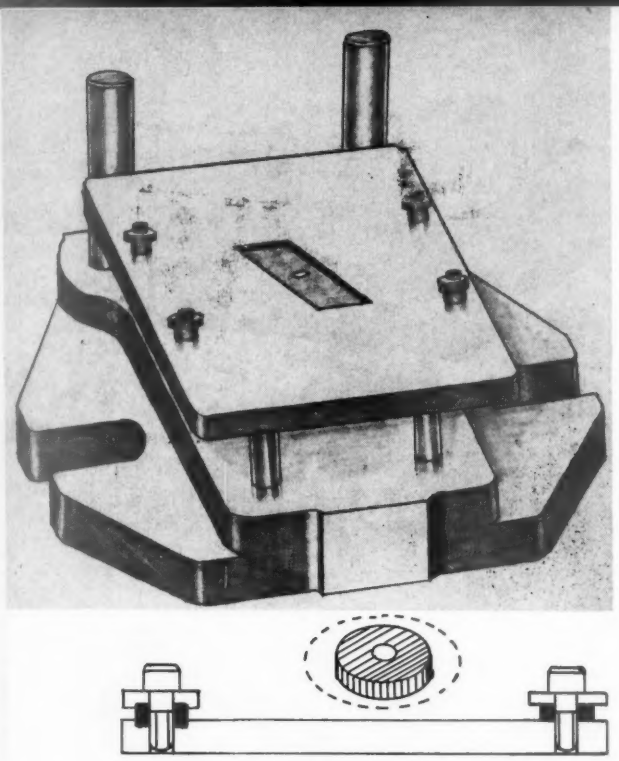
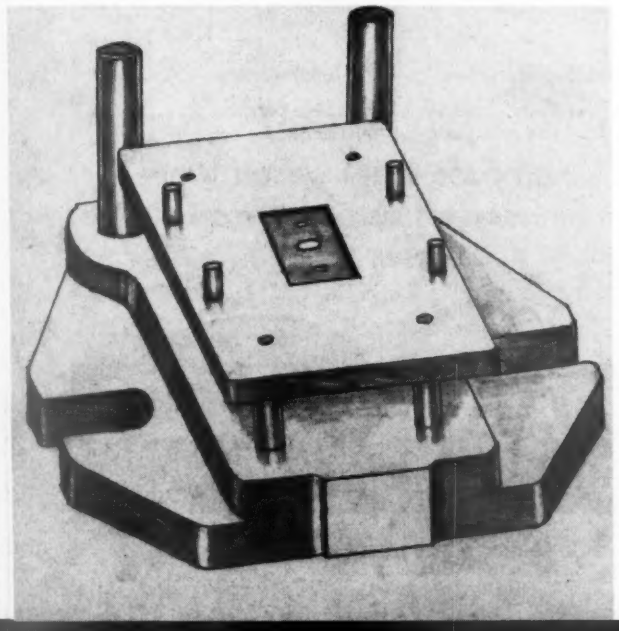


Fig. 2 (above). This shows a typical application of standard carbide bushings as stock guides on the strippper of a compound die. The bushings are not brazed in position but are securely held by a screw and washer as shown. The washer, being about 3/16" greater in diameter than the bushing, prevents the material from escaping.

This offers a distinct advantage in that any wear that occurs on the carbide surface can be offset simply by loosening the screw and rotating the bushing sufficiently to present a new area of contact for the edge of the strip. The drawing shows two methods of mounting the bushing. At the right is the more simple of the two whereby the surface of the bushing is flush with the surfaces of the washer and plate.

In the event of strip stock that would tend to burrow the carbide, the construction shown on the left is preferred. This calls for counterboring the surfaces of the plate and the washer so that the carbide can seat there-in.

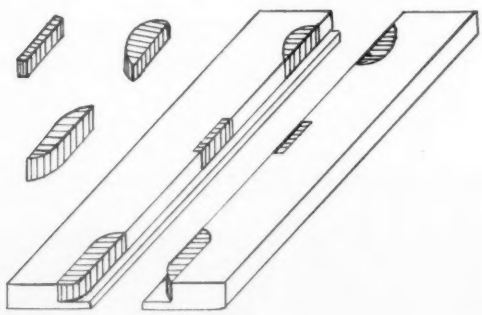
Fig. 1. (below). This shows the simplest possible employment of carbide shapes for stock guides, i.e., solid ground cylinders comparable to dowel pins. See text for the few precautions covering this style.



In quantity production of metal stampings today, material is being fed through the dies automatically and at ever increasing speeds. These high speeds subject the stock guides and strippers to terrific abrasion by the friction of the edge of the metal strip as it passes through the die. Lamination stock, spring steel and light shim steel, in particular, wear away stock guides so fast that even though the guides are hardened they look as though they were made of some soft composition material and cut with a sharp knife. This condition, if left unattended, can lead to irreparable harm to the die and cause extensive loss in scrap parts, labor and valuable material.

To overcome this menace to quality and quantity production, the carbide insert is employed with great success. Some of these inserts have been made by the manufacturers of carbide tools to be used specifically on strippers and guides and are carried as stock items in various sizes. Substitution of other standard carbide shapes serves equally as well, depending upon the method of use. The cost of these standard inserts is surprisingly low and for the efficient service they render they are worth their weight in gold.

On a typical compound die, the simplest type of carbide stock guides are solid round ground cylinders, Figure 1, very similar to dowel pins. The carbide cylinders are pressed



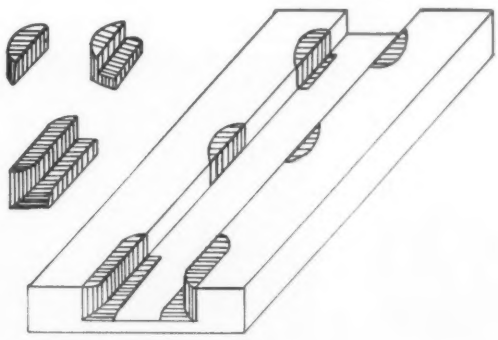
by Ernest J. Urbas
Superintendent
Tool and Die Department
THE GUARANTEE SPECIALTY
MANUFACTURING COMPANY
Cleveland, Ohio

into four holes, jig bored or properly drilled and reamed, so the material will pass freely between them. A few simple precautions must be observed in order to insure success of these stripper stock guides. First, the stock guide pins must be outside of the perimeter of the die ring. This is to insure or prevent breakage of the pins if contact is made with the die ring or pressure is applied against them by a trapped piece falling between the die ring and stock guide pins. Secondly the pins must be high enough, usually approximately three quarters of an inch, so that the material will not escape from the stock guides.

Standard Carbide Bushings Used on Compound or Progressive Die Guides and Strippers

A typical installation of carbide stock guides on a compound die stripper incorporates the use of standard carbide bushings without any brazing. This method, Figure 2, employs the use of a plain washer on top of the carbide bushing with both held in place by a bolt passing thru them and secured to the stripper. In the event any wear should occur on the guides, the bolt is loosened, the carbide bushing rotated slightly and then the bolt is secured again. The washer used on top of the bushing is about 3/16″ greater in diameter than the carbide bushing. This will prevent the material from escaping from the guides. The simple installation on the right, Figure 2, offers a quality guide for light materials. On thin materials the method on the left, using a recessed washer and stripper, prevents the material from burrowing beneath or above the carbide bushing.

. . . *Continued on page 72*



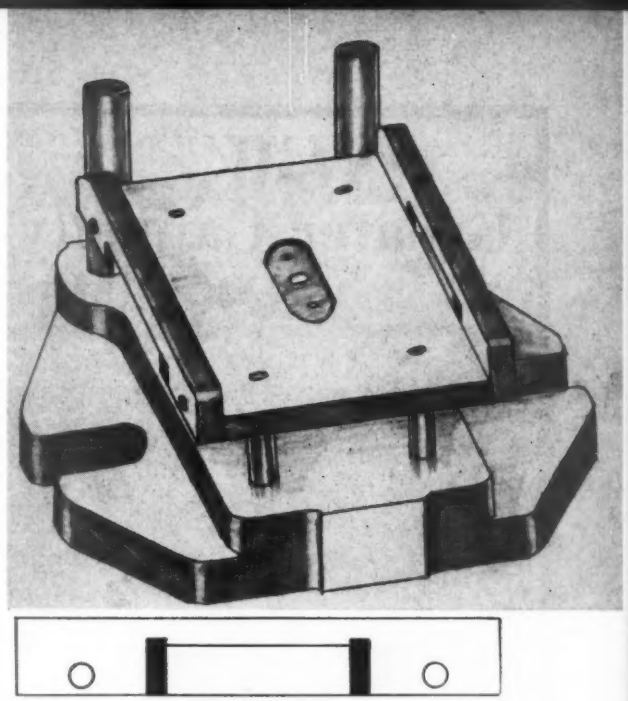
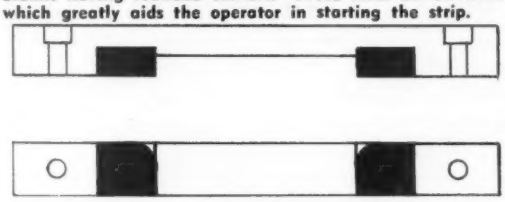
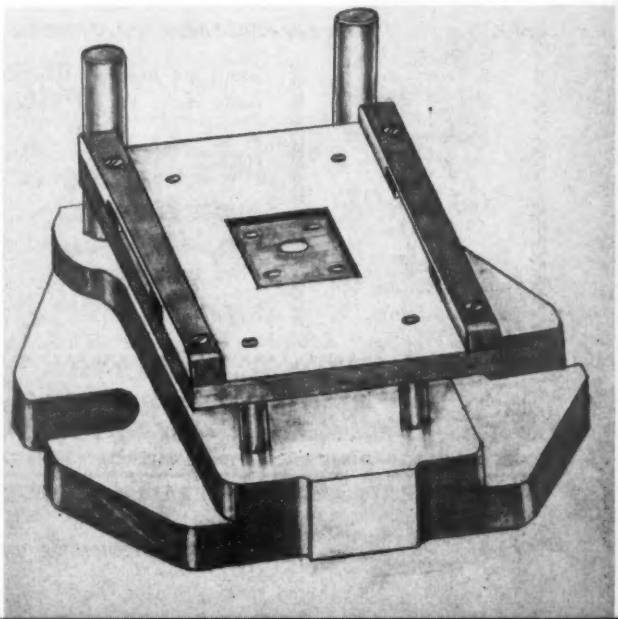


Fig. 3. An example of standard carbide blanks incorporated in bridge-type stock guides mounted on the left and right ends of the stripper. The inserts are secured by brazing after which they are ground to the correct stock clearance. The drawing shows a side view of the bridge-type guide with carbide insert brazed in milled recesses.
At the bottom of the two center columns are shown inverted views of strippers and stock guides using carbide inserts of special shapes which are manufactured specifically for this use. These inserts are brazed into milled pockets and are then ground flush with the stripping face and flush with the sides to the correct stock clearance.

Fig. 4 (below). This bridge-type stock guide which is mounted on top of the stripper uses standard carbide blanks having rounded corners. These form an entrance which greatly aids the operator in starting the strip.





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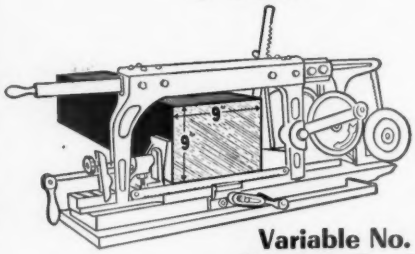

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Mobile Gage Testing Laboratory

This specially-built 28-foot trailer houses the new Detroit Ordnance District Mobile Gage Laboratory, the first of its kind. Cost of the trailer and its precision testing equipment is reportedly $60,000. Insulation and air conditioning make it possible to hold the working temperature to 68 degrees, the standard for gage testing.

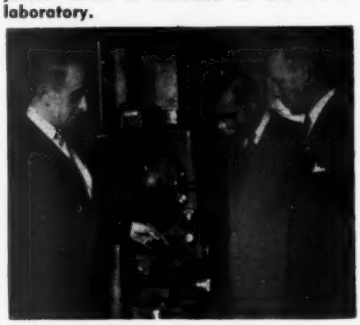
The nation's first mobile gage testing laboratory, designed and built for the Detroit Ordnance District, first parked at the Evans Products Company, Plymouth, Michigan, on January 5.

One of the prime contractors supplying the Ordnance District with war material, the Evans company is producing motor bodies, machine gun tripods and several other military components. The Company, pioneers in the field of railroad car loading equipment and manufacturers of automotive heaters and battery separators, is supplying other branches of the service both as prime and sub contractor.

Purpose of the new mobile laboratory, housed in a 28-foot trailer, is to provide manufacturers serving the Detroit Ordnance District with complete, on-the-spot, facilities for checking precision gages used in military production. The

Continued from page 80

Dan Corn, Detroit Ordnance District resident inspector assigned to the Evans Products Company at Plymouth, Michigan, "introduces" E. S. Evans, Jr., president of the company (right) and E. W. Marchand, vice president in charge of operations, to the Eastman Contour Projector which is included in the trailer laboratory.



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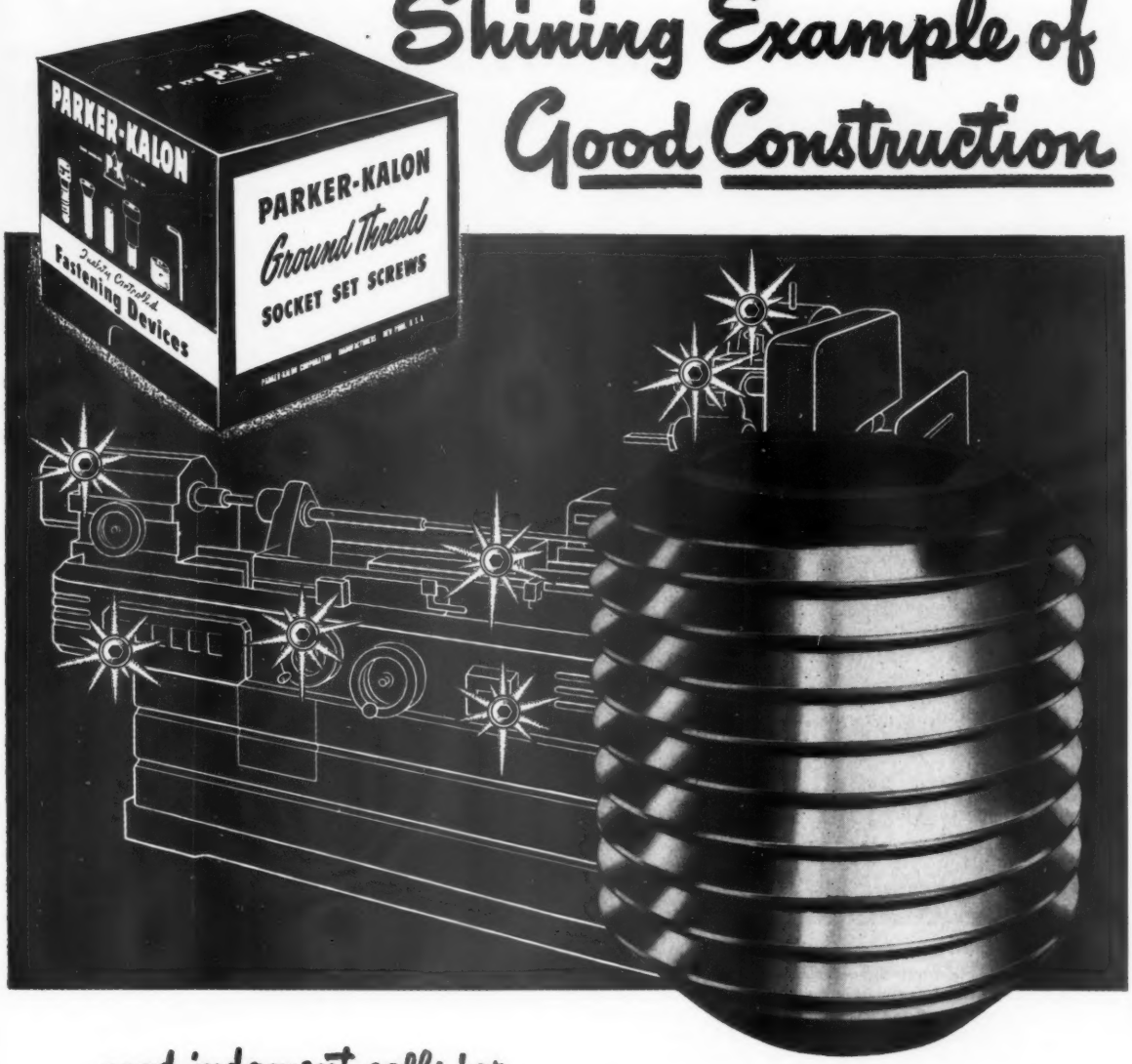

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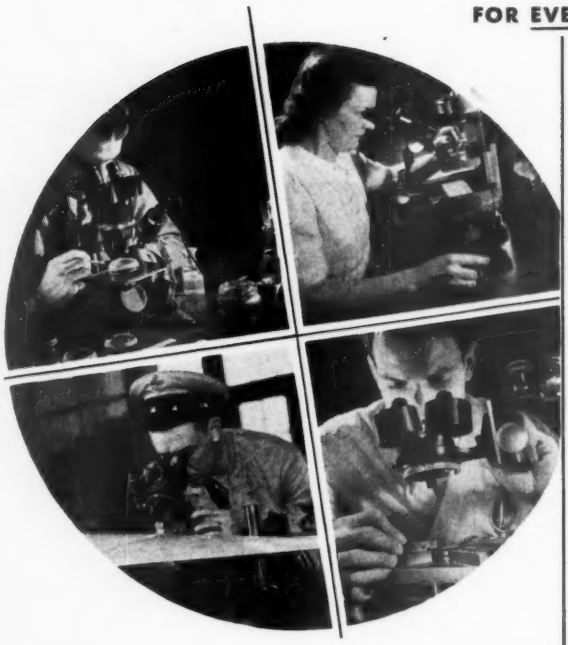

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Combines advantages of No. 25 and No. 23. Takes opaque and transparent specimens. Scans large areas.

. . . Carbide Inserts, from page 69

Compound Die Stripper With Bridge Guides, Side Mounted

Another application of efficient carbide use in a practical and functional manner on compound die strippers involves brazing standard carbide blanks into recesses milled out of bridge type stock guides mounted on the left and right ends of the stripper, Figure 3. These carbide inserts are ground to the correct stock clearance after being brazed. The bridge type of stock guide positively insures that the material is prevented from escaping its normal position.

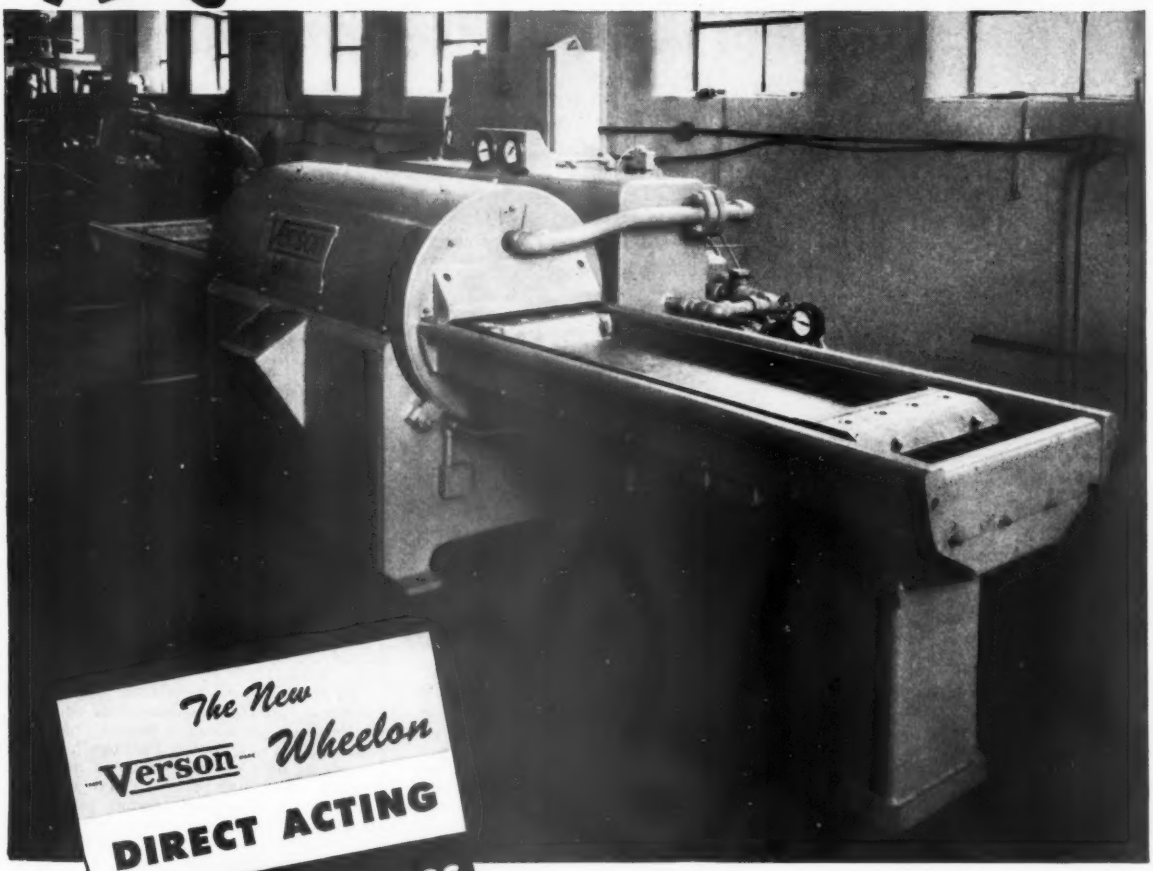
Compound Die Stripper With Bridge Guides Top Mounted

Figure 4 shows another type of bridge type stock guide with carbide inserts as used on compound dies and mounted on the top surface of the stripper. This bridge guide uses advantageously the standard carbide blank having a round corner, the type of blank usually found on carbide lathe tools. The blanks are brazed in such a position as to use the rounded corners of the blanks as starting entrances. This greatly aids the operator in starting a strip of material into the die.

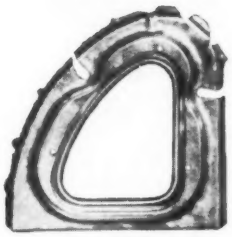
Standard Carbide Inserts for Strippers

On automatic dies the use of carbide inserts in strippers and stock guides has gained its greatest popularity. In these two die details the carbide inserts, which are manufactured expressly for this use, are brazed in milled pockets and are then ground flush with the stripping face and flush with the sides to the correct clearance for the stock width. This successful method assures the ultimate in trouble-free operation.

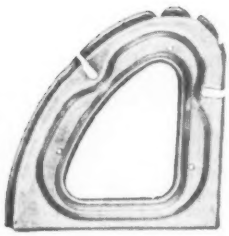
YES— this is a 2500 ton press...



The New Verson Wheelon DIRECT ACTING Hydraulic Press



Formed in a conventional rubber pad press.



Formed in a Verson-Wheelon press.

To meet the demand for a more efficient, more economical method of rubber pad forming of metal, Verson now offers the Verson-Wheelon Direct Acting Hydraulic Press. With this revolutionary new method, it is possible to exert forming pressures many times as great as the practical maximum with a conventional rubber pad press. The small press above, for example, operates at 5000 psi, equivalent to a rated tonnage of 2500. The photos at the left show the superior forming detail.

The advantages of the Verson-Wheelon method are—complete forming of flanges, eliminating hand finishing . . . lower first cost . . . elimination of expensive machine foundations . . . minimum plant space requirements.

Write for bulletin VW-52 which gives further details.

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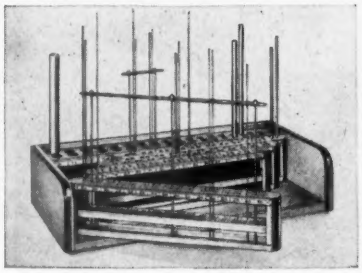
. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

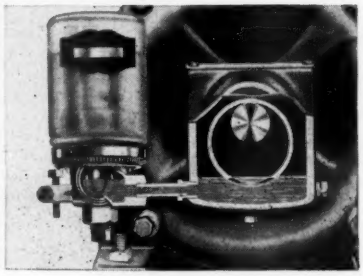


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

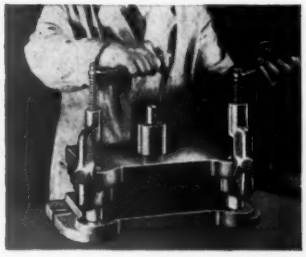
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

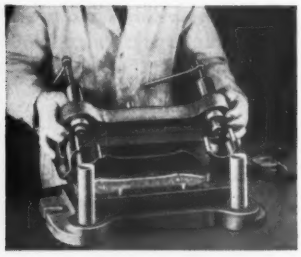
AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS





The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

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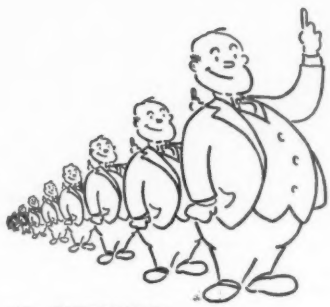

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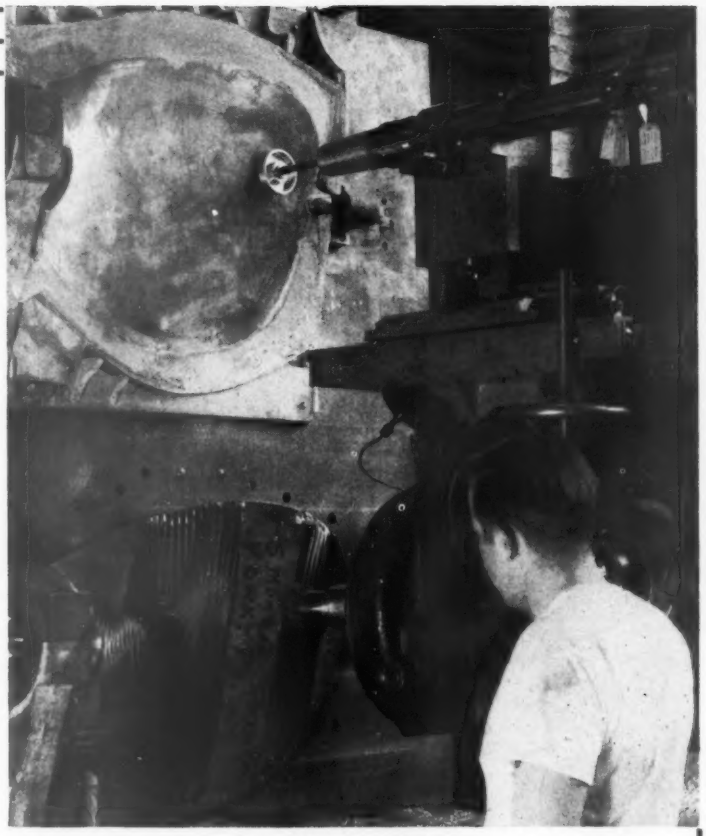

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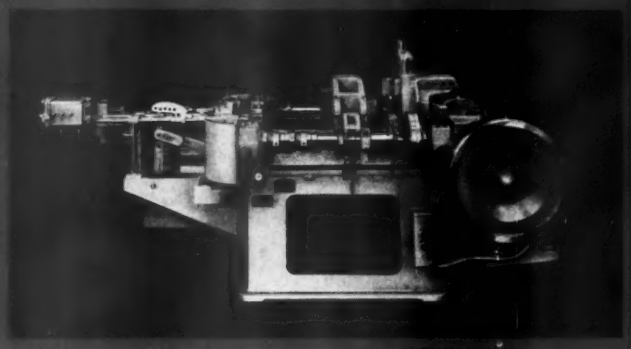
The parts illustrated are just a few of the many different types of precision formed metal stampings that can be produced complete in the U. S. Multi-Slide. In the production of parts like these from coil stock, the U. S. Multi-Slide can effect substantial savings, because it completes a finished part at each stroke of the machine. Many different types of parts which would ordinarily require costly secondary operations can be profitably produced—uniformly and to close tolerances—and the number of inspections is also reduced.

U. S. Multi-Slides are built in four sizes. Illustrated is the No. 33, suitable for material up to 2½" in width, with feed length adjustable up to 13½". Complete specifications for the four sizes are contained in Bulletin No. 15-M. Ask for a copy.



US PRODUCTS

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Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

. . . Drilling & Tapping, from page 64

from 167 to 1765—4 to each spindle; infinitely variable, preselective spindle feeds; automatic cycling through any or all stations with rapid approach, feed, dwell, slow feed out, and rapid traverse out, preselective for each spindle; button controls for set-up and hand operation; accurate depth setting and control; floor space required — 6′ x 6′ — height 10′; weight uncrated approximately 6200 lbs.; spindle runout held to .002″ on 24″ diameter circle; skip indexing from spindle to spindle; and easily accessible controls.

This machine can be used with striking results on straight drilling operations, or on complicated forming tools for ID or OD turning, tapping, threading, plunge cut end milling, large counterboring, and spot-facing, and any other second operation.

Accuracy, rigidity, ease of set-up, power, spindle speeds, infinitely variable feeds, make the machine ideal for short, intermediate or long runs, in any type of material at optimum cutting speeds.

In designing, it has been kept in mind constantly the necessity of using standard parts such as motors or electrical components so the question of replacement parts and servicing is well taken care of.

The power units and controls are nationally recognized products, with replacement parts and service available throughout the country.

Industrial News

Flying to Rio de Janeiro, Brazil during January, was the first step by Robert H. King and John F. Kopczynski, President and Vice President of Pivot Punch and Die Corporation of North Tonawanda, N. Y., in an extended tour to complete plans for distribution of their products in South America. They are expected to return during February.

Slater and Crabtree, Ltd., Wakefield, England are now manufacturing straight-ground high speed steel punches under license with Pivot Punch and Die Corporation and are distributing the product throughout Europe and Australia. Pivot Punch products have been delivered as far away as Asia and the air-trip to South America is the most recent development in the aim of the company to attain eventual world-wide distribution.

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POUND FOR POUND, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line. You get big-truck benefits at rock-bottom, small-truck cost. Take the POWRWORKER stacker, for example: a rugged, modern fork truck, but cut to fit the tighter handling pattern of narrow aisles, low-load floors, limited budgets. Short turning radius, easy finger-tip control and ample power-plant assure fast, safe handling and stacking. Truly big-truck performance in an economical package.
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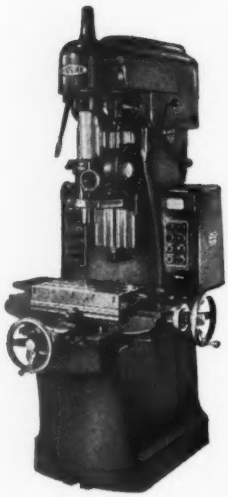
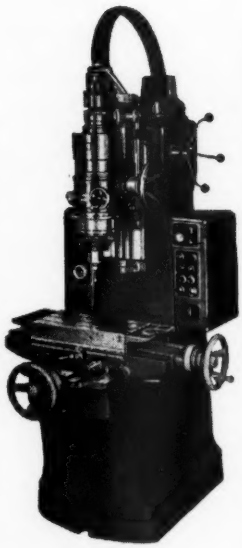
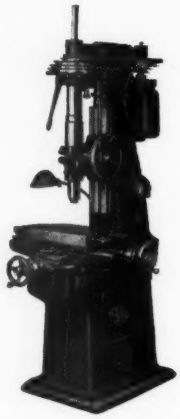


No. 2 MOORE JIG BORER, with its accurate lead screw settings within .0001", offers all the time-proven precision features associated with Moore Jig Borer construction for 15 years, plus numerous labor-saving advantages, including: increased capacity and size; infinitely variable spindle speeds; 3 power feed ratios; centralized controls.

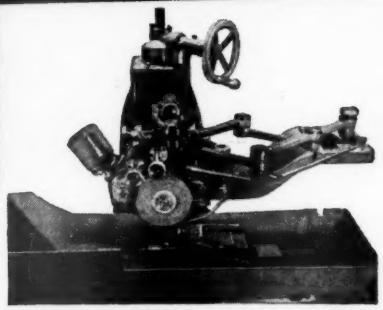
No. 2 MOORE JIG GRINDER. With this new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. Holes from 1/64" to 8" can be relocated and ground within .0001"—by power or hand feed.



Four ways to cut costs and meet competition by mechanizing your toolroom.



No. 1 MOORE JIG BORER remains in the line. For its range—table working surface of 10" by 16" and cuts up to 3½"—this machine is still an ideal buy. There are over 1000 satisfied users. We will continue to offer it for the many situations where a small, accurate jig borer fills the required prescription.



MOORE PANTO-CRUSH WHEEL DRESSER speeds form-grinding and cuts costs. Both crush-forming and diamond-dressing are accomplished with this 2-in-1 unit permanently mounted on the wheel spindle of a surface grinder. You switch from one method to the other without disturbing workpiece setting.

We'll be glad to send you complete descriptive literature on any of these machines.

MOORE SPECIAL TOOL COMPANY, INC.
726 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT

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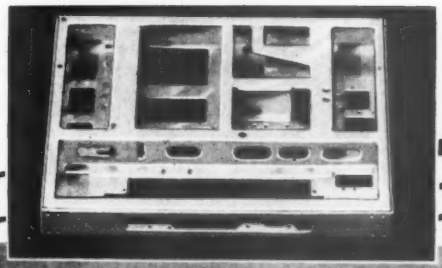
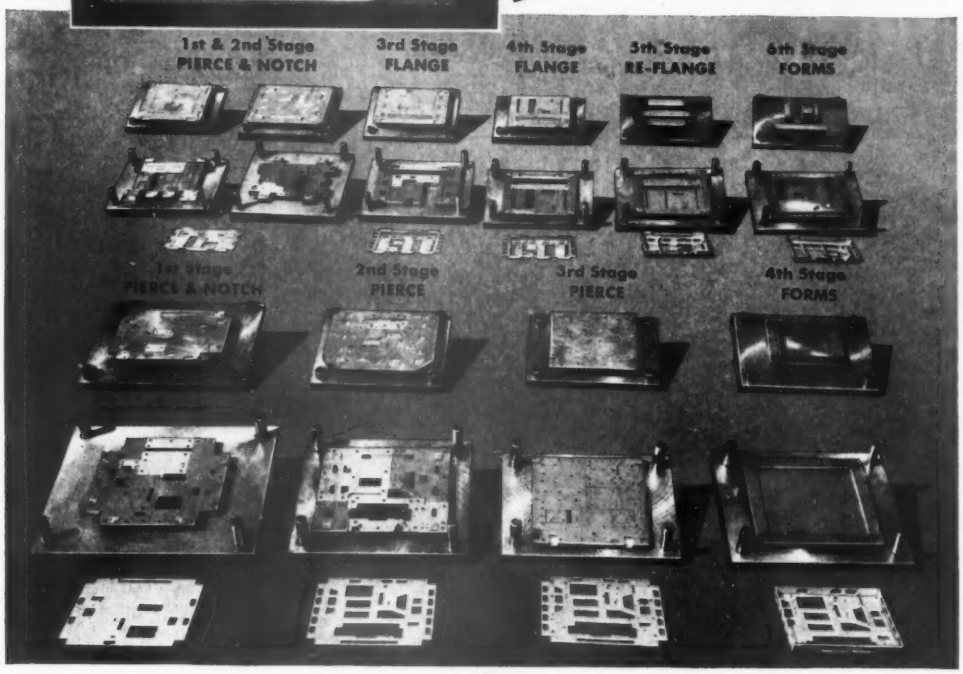


Teletype CHASSIS!



BARTH DIES STEP UP *Teletype* CHASSIS PRODUCTION

Write for the Barth catalogue.

THIS EXTREMELY COMPACT AND INTRICATE CHASSIS comprises the basic unit upon which the entire teletype machine is assembled... precision plus volume production were required.

One set of six dies produces the inner shell . . . another set of four dies produces the outer shell. Square-sheared aluminum sheets are fed to both sets of dies.

Got a complicated tooling or production problem? Bring it to Barths where you get the benefit of 36 years of experience in helping industry do it better, faster and at lower cost through modern tooling and modern special machinery.

BARTH STAMPING & MACHINE WORKS Inc.
12650 Brookpark Road, Cleveland 29, Ohio

DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHINERY

BARNES FAMOUS HACK SAW BLADES

You GET MORE of the BEST when you BUY ...

DETROIT BARNES U.S.A.

HACK SAWS

THERE'S A BARNES BLADE FOR EVERY PURPOSE

CALL YOUR DISTRIBUTOR

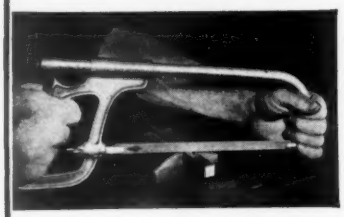
POWER BLADES ...

Barnes' RED ARROW
Made of genuine 18-4-1 High Speed Steel—this blade is unequalled for heavy duty use. It resists heat generated when cutting abrasive or tough materials such as high manganese, stainless or tool steels.

BARNES ROCKET!
Only Barnes ROCKET gives you "Gradient Hardness" HIGH SPEED STEEL—FLEXIBLE POWER and HAND BLADES—Hardened teeth—Semi hard back. Shatter proof—Safe For All-Purpose Cutting. Barnes Rocket—the ideal All-Purpose Blade.

Barnes' SERVICE Molybdenum
Where fast cutting is essential—this production blade performs long and economically. It is recommended for use on low or medium alloy steels in both Hand and Power Blades.

HAND BLADES ...



THERE'S A BARNES' BLADE FOR EVERY HACK SAW OPERATION

Only Barnes exclusive "gradient hardness" can give you a safe, flexible, high speed steel blade with hardened teeth and semi-hard back. The Rocket will stand sudden accidental twists without shattering. It can be used on a wide variety of metals and shapes. Tooth stripping is practically impossible.

DETROIT BARNES U.S.A.
Established 1919
W. O. BARNES CO., INC.
1297 TERMINAL AVE. · DETROIT 14, MICH.

. . . Mobile Gages, from page 70

trailer's complement of gage-checking equipment is better than that found in most industrial plants. Weighing just under five tons and carrying a crew of three technicians, the cost of the trailer and its equipment was about $60,000.

The mobile test lab was conceived under the direction of Brigadier General Paul Seleen, commanding general of the Detroit Ordnance District. The idea belongs to Major George Wolf and was about three years in the making.

There is a surprising amount of working space within the travelling "inspection department". The equipment is up-to-date and more complete than that found in many plants. Storage space for more than 80 pieces of test equipment is provided by overhead cabinets and by drawers under the benches.

The trailer-lab has three distinct advantages:

First, it will make possible tremendous savings in production time by bringing gage-testing facilities right into a plant. Heretofore, it was customary for an inspector in the Detroit area to take a questionable gage into the Ordnance District's permanent laboratory in Detroit. Sometimes, that meant several days' lost time on vital war production. In mid-winter or mid-summer, the sensitive gages could contract or expand enough during transit from plant to lab to make tests invalid until they had been brought to specified testing temperature.

Second, because of its regularly scheduled calls and the closer check thus made possible on precision gages, it is expected that millions of dollars will be saved through the reduction of parts scrapped because of not meeting the ultra-close tolerances required of prime contractors.

Third, a regular schedule of visits by the mobile lab to plants in the District's area will keep

. . . Continued on page 86

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Introducing

A COMPLETE LINE OF STANDARD HIGH SPEED AND CARBIDE TOOL BITS

Whitman & Barnes is pleased to announce that it now manufactures and stocks a quality line of Tool Bits *** Carbide Bits have the right grade of selected carbide strongly brazed to bodies for long tool life. There is a type for all metals—red colored for cutting steels—grey colored for cast iron and non-ferrous materials. Both W&B Carbide and High Speed Tool Bits will give that comparative edge performance which is necessary for increased production. *Write for complete details.*

W&B *"Makers of Fine Tools Since 1848"*

WHITMAN & BARNES

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Machining Armor Steel, from page 50

After milling, the powders are mixed with paraffin and then pressed into the required shape.

In this instance the feed was too heavy. The thin carbide could not withstand the heavy cutting pressure and fractured, allowing the cutter body to drag on the work. Decreasing the feed to .006" chip load per tooth put this shell end mill back in service.

The final process are pre-sintering which burns out the paraffin, dirt and any other inclusions, and, to complete, the blank is raised to sinetring temperature, which is slightly below the 2714° F melting point of cobalt.

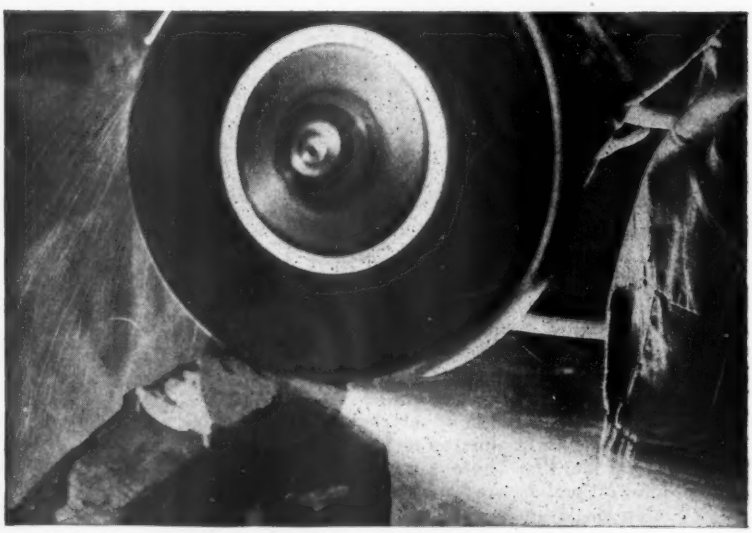
To meet the demands of industry, there are various grades of carbides. The three methods used to control the grades are: first, the addition of other ingredients, mainly titanium and tantalum. The addition of these two materials helps to overcome the tendency of a continuous chip cutting material such as steel to weld itself to the tungsten tip. During this welding process, small particles of tungsten carbide are torn loose, causing the tip to crater. Titanium and tantalum provide an anti-weld quality to the blanks which alleviates the cratering condition. The second method, controlling the particle size, influences the hardness and abrasion resistance. The third method, that of varying the amount of the bonding agent is a compromise between hardness and toughness. The more cobalt the tougher, the less cobalt, the harder.

The chief physical characteristics are listed below, one column giving the advantages, and the other the disadvantages.

Advantages

1. Hardness
2. High Red Hardness
3. High Compressive Strength
4. Extremely Rigid

Insufficient side clearance caused heel of shell end mill to drag and fracture blade. This, in turn, so increased the cutting pressure that blade and backing snapped. Increasing side clearance to 12° alleviated this fault and resulted in satisfactory performance.



How Norton brings you the "TOUCH OF GOLD" that adds more value to every grinding job

Grinding, the most universal, most basic of all production processes, is the true "Touch of Gold" that increases the usefulness — and the value — of every manufactured article. That's what happens every time Norton grinding wheels touch the grinding jobs *you* do.

Here are the facts on how Norton leads the field in producing and improving the "Touch of Gold" for you and for all industry.

FIRST IN SIZE

At "Norton City" over a mile of buildings and thousands of skilled workers, constitute the greatest single supply-source of abrasives and abrasive products — world headquarters for your "Touch of Gold". Here also is the world's newest, most modern grinding machine plant, and the famous Norton School of Grinding.

FIRST IN RESEARCH

At Norton over 100 trained technicians, in 19 specialized laboratories, are constantly engaged in product improvement and application. This includes not only the development of new abrasives, bonds and processing techniques, but cooperation with customers in the solution of everyday grinding problems.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

5. High Resistance to Corrosion
6. High Wear Resistance

Disadvantages

1. Extreme Brittleness
2. Low Thermal Shock
3. Low Mechanical Shock
4. Low Resistancy to Bending Strains

As stated before, these characteristics offer tremendous possibilities in removing metal. To name a few, high feed and speeds due to the high red hardness, ability to take heavy cuts when its high compressive strength is utilized, more metal removed between tool changes and machining materials too hard for ordinary cutting tools.

Armor steel, due to the inherent physical properties built into it for the specific job it is designed to perform, is perhaps one of the most difficult steel compounds to machine. Tungsten carbide when properly used, helps to simplify and speed up the machining of armor steel; either as forgings, castings or plate. Even though tungsten carbide helps, it is not the entire solution for the efficient machining of armor; nor in all cases is it entirely satisfactory.

The minute fractures of the carbide along the cutting edge denote too keen an edge. Honing the edge, at a 45° angle, to a .002" to .005" flat, removed the microscopic saw-tooth edges allowing this facing cutter to operate efficiently.

To successfully apply tungsten carbide to armor steel machining, there are several factors to be considered. These factors are: (1) the machine, (2) fixturization, (3) method of presenting tool to the work, (4) grade of carbide and, (5) design of the carbide tool.

A brief word on machine selection will help clarify some of the problems encountered with the cutting tool. The machine must be rigid, not only the frame but also the spindles, especially on

. . . *Continued on page 89*

Too slow a surface speed resulted in the tooth fractures shown on this shell end mill. By increasing the speed to 275 sfm the fault was eliminated.

From Norton laboratories come "TOUCH OF GOLD" exclusives like these

Norton New-Process Wheels are unequalled for uniform structure, identical performance and long, even wear.

32 ALUNDUM* Abrasive, another Norton "first", is one of the most revolutionary developments in abrasive history.

NORBIDE* Abrasive, hardest man-made material, replaces costly diamond dust in many polishing and lapping jobs.

FIRST IN PRODUCT-RANGE

Norton offers you the most complete line of abrasive products, all manufactured to strictest quality control standards. Norton ALUNDUM* and CRYSTOLON* abrasives, with Norton-developed bonds, make available hundreds of thousands of grinding combinations.

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1. Your Norton Abrasive Engineer is skilled in every detail of grinding wheel manufacture and application. He's ready to study your grinding problems and help you find money-saving answers.

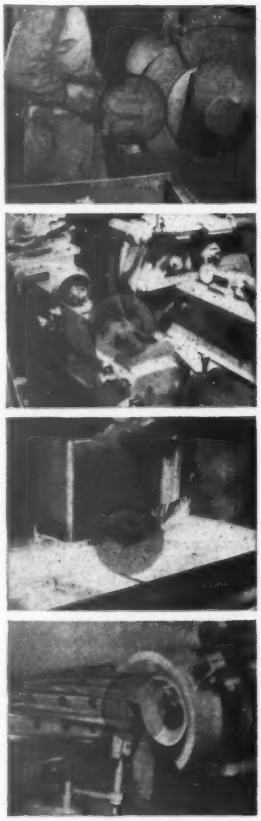
2. Norton Warehouses are located in key industrial centers. Each contains large stocks, highly trained personnel and special wheel alteration equipment. And they are backed by the huge stocks at Worcester — further assurance of prompt deliveries, wherever you're located.

3. Your Norton Distributor can give you valuable help in selecting the right Norton wheels. He maintains adequate stocks to meet the needs of your area. He is your direct connecting link with the entire Norton organization — world headquarters for the "Touch of Gold" that means more profitable grinding for *you*. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. *Trade Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON ABRASIVES

Making better products to make other products better

Make sure your grinding gets the top value-adding "TOUCH OF GOLD" — with Norton abrasive products



. . . Diamond Substitute, from page 39

used at first as an electrolyte (Fig. 3). This represented a very serious problem and one that caused us considerable concern. Examination of the discolored braze section, however, indicates that the braze material itself is only stained, and not actively attacked. Both Norton Company and Super-Cut, Inc. claim to have overcome this problem with a new electrolyte, and our latest work with their solutions seems to bear out their claims.

There is still a great deal of work that must be done on electrolytic grinding before it can be accepted as a substitute for diamond grinding and one that will provide a method for saving appreciable quantities of diamonds. It has distinct possibilities for the offhand finish grinding of cemented carbide tools, but is a long way from being commercially accepted throughout industry. In the writer's opinion, it will only be accepted as a method of grinding when diamond wheels are no longer available. It involves expensive rectifier equipment, and it is not as attractive a method for the operator due to the flood of electrolyte material that is used. Also, the grinding times are slower per tool and would require additional machines to maintain the same production rates.

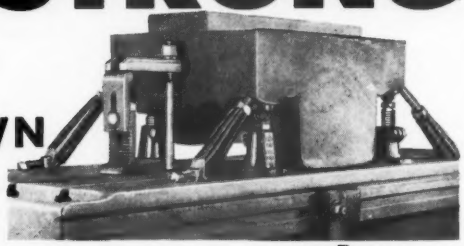
The Cavitron machine discussed earlier is an electronic discussed earlier is an electronic unit delivering electrical impulses at an extremely high rate per second which, when carried through a transducer, becomes a mechanical stretching motion. A tool attached to the transducer is vibrated thousandths of times per second and when placed in contact with the work and a suitable abrasive is introduced, the tool will feed its way into the work. Complexity of shapes is no problem in this procedure, nor is the hardness of the workpiece. Cemented carbides are readily machined by the process, using soft steel tools. The application of this process to the internal shaping of complex carbide dies appears to be a distinct possibility; however, the volume of diamonds saved here is of no real importance.

It would seem from recent tests, that have been conducted on some chipbreakers by this method, that the real potential in the Ultrasonic Engraving Process lies in the field of chipbreaker forming. Very satisfactory chipbreakers have been formed by this method in Kennametal cutting tools in what is considered economical time. Since it is estimated that 20% of the industrial diamond bort that is used in this country

. . . Continued on page 88

ARMSTRONG

SET-UP and HOLD-DOWN TOOLS



ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

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"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

PLANER JACKS

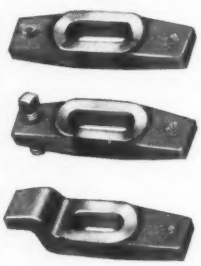
NON-SKID JACKS

STEP BLOCK

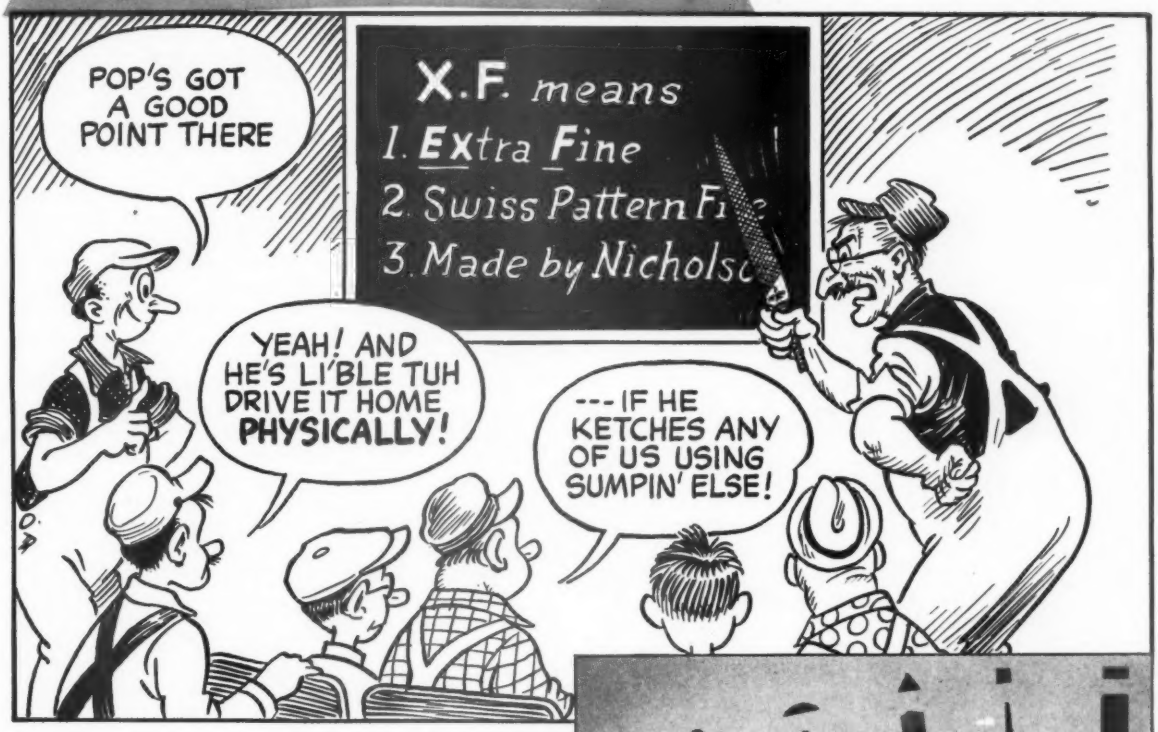
UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

T-SLOT CLAMP

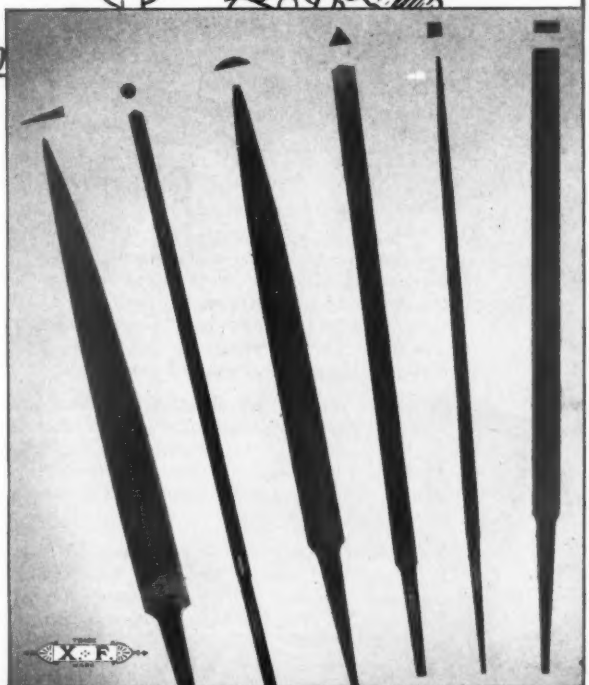

STRAP CLAMPS

POP'S school of filing


POP'S GOT A GOOD POINT THERE
X.F. means
1. Extra Fine
2. Swiss Pattern Fi
3. Made by Nicholso
YEAH! AND HE'S LI'BLE TUH DRIVE IT HOME PHYSICALLY!
---IF HE KETCHES ANY OF US USING SUMPIN' ELSE!

THEY can't put anything over on Pop. He knows (as most good foremen know) that where there's precision filing to be done, there are specially precise files for doing it, viz.: Nicholson X.F. Swiss Pattern Files. He knows, too, that "X.F." means "*E*xtra *F*ine." And for good reason: With 89 years' file-making experience and more Swiss Pattern production than any other manufacturer in America, Nicholson can well be expected to turn out the absolute tops in accurate shapes and cuts and the utmost in quality.

SOLD THROUGH INDUSTRIAL DISTRIBUTORS in all popular individual types; and in such special groups as Die Sinkers Files, Round and Square Handle Needle Files, Filing Machine Files; Silversmiths and Die Sinkers Rifflers. FREE CATALOG.



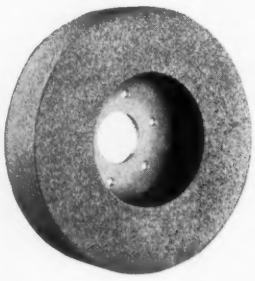
NICHOLSON U.S.A.

NICHOLSON FILE COMPANY
95 Acorn Street, Providence 1, R. I.
(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

NICHOLSON FILES FOR EVERY PURPOSE

but . . . for carbide tool grinding
SIMONDS WHEELS
cost much *less*



SIMONDS ABRASIVE CO.
Grinding Wheels

Sharpen *your* carbide tools the economical way. Avoid damaging sensitive edges. Prevent shape distortion. Use Simonds' G Electrolon (silicon carbide) grinding wheel. It's the popular "green" wheel . . . less expensive than diamond wheels . . . but a "gem" for safe, cool grinding that prolongs tool usefulness.

Especially efficient for roughing and semi-finishing, these wheels are also frequently used for finishing, too. Made to high standards of accuracy, as are all Simonds Abrasive Company products . . . including grinding wheels, mounted wheels and points, segments and abrasive grain.

Write for your copy of our bulletin (ESA 181) about G Electrolon wheels, including type PM (plate mounted) and tool and cutter shapes—*All* available from stock. Your Simonds Abrasive distributor is equipped to serve you locally. We'll gladly send you his name too.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

. . . Mobile Gages, from page 80

production men constantly aware of the need for keeping close watch over the accuracy of their production machinery and its products.

The construction of the mobile lab trailer is similar to that of a refrigerated truck body. Its walls and floor are heavily insulated. It is completely air conditioned and carries its own heating system. During tests at the Detroit Tank Arsenal, inside temperature was kept at 68 degrees at 40 below zero outside. The trailer is wired for 110-volt operation and takes its electrical power by cable from any plant lighting system and can be operated either inside or outside a plant.

In addition to keeping a close check on gages used in military output, the mobile Ordnance lab is also equipped to repair and certify gages. Army Ordnance inspectors keep close records of the number of times a gage is used, the kind of material it tests, and the probable life expectancy of a gage. The itinerary of the trailer lab can be changed to conform to schedules determined by these records. At the Evans plant, for example, test schedules call for visits by the trailer and its crew of three test men once each month. On each visit, about 120 gages will be inspected.

Inside, the trailer is a compact,

The bed of the P & W Universal Measuring Machine goes through a three year seasoning cycle to insure the stability essential to such precision measurements as are undertaken by the laboratory: fractions of a millionth of an inch.

business-like laboratory whose dimensions are roughly 26 feet in length, seven and a half feet in width and seven feet from its triple-layer floor to its paneled roof. Along the right wall, on either side of the center door, are waist-high counters about two feet deep. Cabinets are built below these. More cabinets are built up to the roof. The left wall of the

Continued on page 94

MICROBORE by DE VLIEG

FOR PRECISION BORING

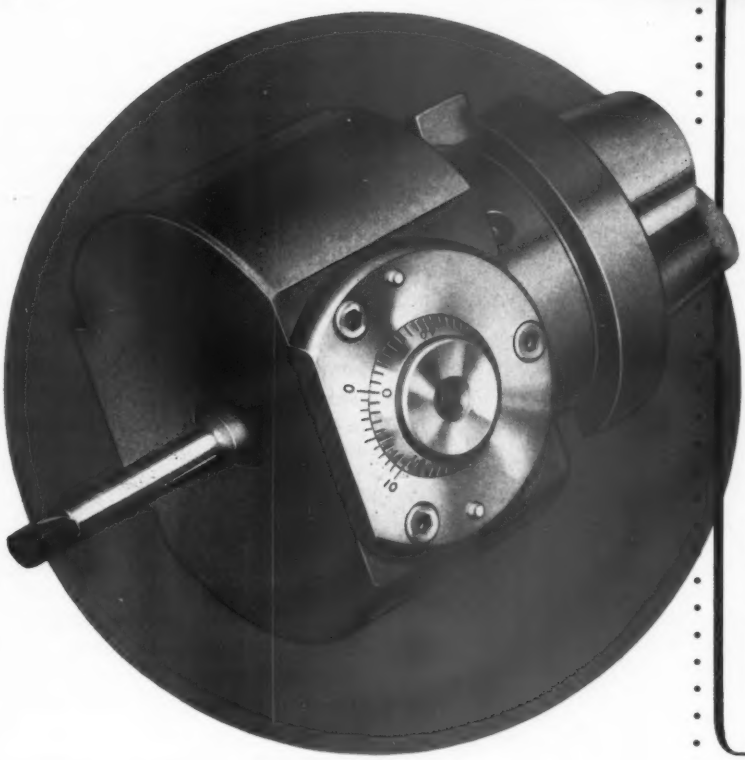


Illustration at right shows boring head with standard set of boring tools mounted in a fitted hardwood case.

The NEW MICROBORE MB-121 ADJUSTABLE BORING HEAD

This Boring Head is adjusted rapidly and accurately by means of proven Micrometer Vernier principle. The tool slide can be adjusted in accurate increments from zero to ¼" off center. The boring head can be furnished with straight, taper, or flanged type shanks to suit any make of boring machine. With a standard set of boring tools, bores ranging from ¼" to 1" diameter can be machined.

DE VLIEG of DETROIT

DE VLIEG MICROBORE CO.

. . . Diamond Substitute, from page 84

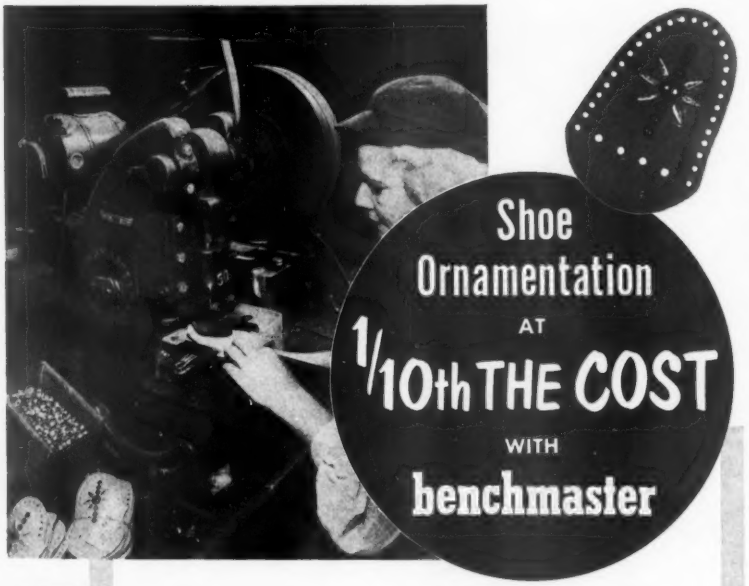
goes into chipbreaker grinding wheels, this application appears to be a real potential possibility for the Cavitron process.

Recent tests conducted in the use of CO_2 as a coolant in the grinding of Kennametal material proved to be somewhat disappointing. The results of our limited tests indicate that this method represents a decided improvement over the dry grinding of Kennametal with a silicon carbide wheel. However, we found that these same results could be achieved by the conventional method of using an ample supply of coolant in conjunction with the silicon carbide grinding operation. Tests conducted on diamond grinding operations indicated that there was no appreciable advantage to be obtained by the use of CO_2 as a coolant in conjunction with the diamond grinding. Based on our limited experience, it would seem that there is no real potential savings in the use of diamond bort to be anticipated from this relatively new and novel idea.

One possibility that does show real promise to the writer in the conservation of industrial diamonds is the use of abrasive belts in the finish grinding of cemented carbide tools. The Fenlind Engineering Company, in cooperation with Behr-Manning Corporation, has developed an offhand grinder that uses silicon carbide abrasive belts traveling over a 14" diameter cast iron wheel. Front and side clearances on single point tools can be ground on this machine and a cutting edge superior to that normally obtained from silicon carbide wheels can be obtained. The machine is listed as a Micro-Finisher by the manufacturer, but we take exception to this. Actually, it will not produce an edge as good as that obtained with a 180-grit diamond wheel. Nor will it superfinish an edge. However, a carbide tool rough ground on a 60 or 90-grit silicon carbide wheel and finished on a 150-grit silicon carbide abrasive belt will have a cutting edge that will be successful in most cutting applications. Belt costs are low—less than one cent (1¢) per tool—and belt changing is done easily and quickly.

Here is a real opportunity to save industrial diamonds. It, too, will require some work. Grinding is now being done dry; it should be wet. Top grinding cannot be done on the present machine. It is essential that all surfaces of a tool be ground on the one machine before it is completely practical. There is no question but that these changes will come with later developments and refinements.

. . . Continued on page 92



Five years ago GUILD SHOES replaced its special machines for ornamenting leather with its first Benchmaster Punch Press. So successful was the application that 14 Benchmasters have now been installed, one for each separate die operation. *Installation of the extra Benchmasters has proved more economical than continually changing dies!* Now, two good operators working all 14 Benchmasters *supply the entire factory* with ornamental pieces! Both 1-ton and 4-ton Benchmasters are in use.

MORAL: Whatever the application, for high production at low cost, it's tough to match a Benchmaster! *Write for folder showing all models!*

benchmaster
MANUFACTURING COMPANY
1835 W. Rosecrans Ave., Gardena, California

. . . Machining Armor Steel, from page 83

lathes used for intermittent cuts and, also, milling machines where the cutting action is a series of intermittent cuts. Machine ways must be heavy and all slides well fitted to minimize vibration and chatter. This is extremely important as the low mechanical shock characteristics of tungsten carbide prohibit even very little vibration. As speeds and feeds are increased more horse power is required to remove metal; more about feeds and speeds will be discussed under methods of tool presentation.

The machine must have enough horsepower to utilize the higher speeds and feeds demanded by the work hungry tungsten carbide cutting tools and must be able to transmit it to the cutting area with the minimum amount of vibration, back lash and at a constant rate when measured in RPM and feed per revolution. These briefly are the requirements of the machine tool, and summarized are as follows: (1) extreme rigidity, (2) high horse power, (3) higher speed range than for high speed steel cutting tools, and (4) speed and feed clutches capable of transmitting the additional horse power.

These requirements are generally built into new machines, but when adapting an older machine, must be considered, as merely increasing the horse power of the motor does not always increase the applied horse power, nor does the addition of a higher speed motor always increase the effective spindle speed.

The second major factor to consider is fixturization. Fixtures are devices designed to hold the workpiece in such a manner as to present the area which is to be machined to the cutting tool in a uniform manner. Fixtures with use for carbides must be designed to hold the workpiece solidly and rigidly. Tungsten carbide is said to be "work hungry," and due to this fact, more chips are produced in a given length of time than with high speed steel. An effective fixture must have provisions built in to clear these chips.

Tungsten carbides when used with coolants must be completely flooded to prevent breakage due to thermal shocks. Fixtures must be designed in such a manner as to allow coolant to be applied copiously in an unrestricted flow. This phase also has a direct bearing on the chip clearance problem. Summarized, fixtures must be extremely rigid, the workpiece clamped solidly, ample chip clearance must be provided and the fixture and chip flow must not offer obstructions to the coolant stream.

The third factor to be considered is tool presentation.

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This breaks into three broad phases, some of these have a direct bearing upon the other factors. The phases are (1) cutting speed, (2) feed, and (3) method of holding tool or tools. A simple definition of the cutting speed is the linear inches or feet which pass beneath the cutting tool in a given length of time. This is generally spoken of in surface feet per minute and is one of the most important items in the successful utilization of a tungsten carbide cutting program.

There is a definite relationship between the cutting speed, feed, grade of carbide, depth of cut and steel hardness for the most efficient tool life. The following empirical formula is one that has been developed, based on this relationship:

$$S = \frac{29{,}000}{(0.25D) \times (0.42F) \times (1.25B)}$$

Where :

S=recommended cutting speed in feet per minute

D=depth of cut in inches

F=feed in inches per revolution

B=hardness of steel (Brinell reading)

This is one of the basic formulae used in the engineering of tungsten carbide. Through years of use, tables have been compiled and simple slide rule type instruments have been designed to facilitate the use of this data. There are other variables which enter into speed and feed selection which are not applicable to formula determination.

Some of these variables are in the chemistry of the steel and are not easily controlled, others concern the use of various coolants or cutting oils. Due to these and other uncontrollable factors, no hard and fast rules can be set up for predetermining the most efficient cutting speeds and feeds. The above formula or tables and slide rules are only guide posts which can be used as a starting point.

As previously mentioned, speeds and feeds determine the horse power requirements. One of the empirical formulae developed for horse power calculations is as follows:

HP = DxFxSxCx130%

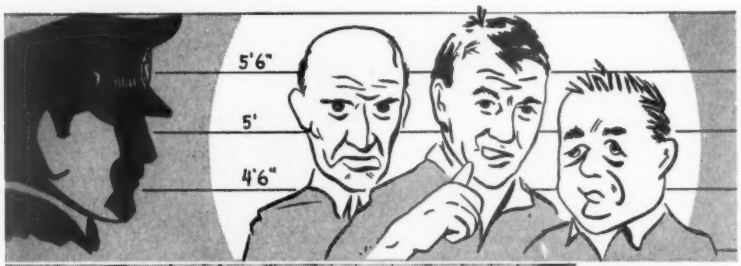
D = depth of cut in inches

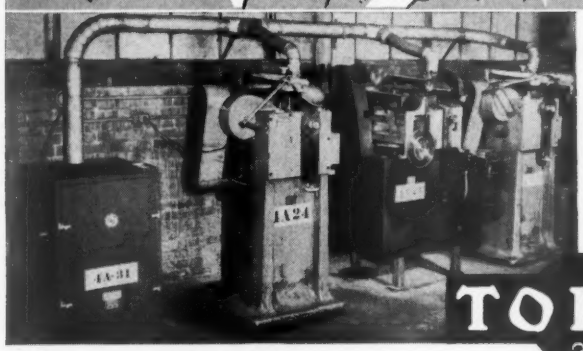
F = feed in inches per revolution

S = surface feet per minute

C = power constant. This is to be determined by the material to be cut and varies from 6 for SAE 1010-1025 to 9 for SAE 2330-2515.

For a simple fast calculation, slide rule type instruments have also been developed. As can easily be seen from the above formulae, all calculations are based upon the cubic inches of material removed per minute. The only accurate and fair way





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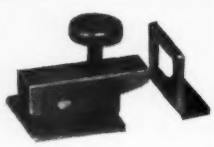

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to determine tool life and efficiency is by the amount of material removed in a given space of time, and not, as is so often done, measured by number of pieces per grind or per hour. In all cases the applied horse power must not fall below the calculated.

The feed is generally figured at 1/8 to 1/20 of the depth of cut. This is also only a guide post and can only be actually set after the job has been set up. Another guide post is that light feeds increase wear while heavy feeds increase tool pressure which in turn will increase chipping and breaking. Quite often the finish requirements will determine the feed rate, i.e., the finer the finish, the slower the feed per revolution.

The third phase in tool presentation is that of holding the tool or tools. Carbide may be either brazed on or mechanically held to the shank. This holds true not only for single point tools but also, multiple point tools such as milling cutters. Adequate support for the tungsten carbide tip is a necessity. This support is generally three times the thickness of the tip, and the shank steel must be made of a material which will resist bending strains.

The tip size is dependent upon the depth of cut, feed, kind of cut (continuous intermittent etc.) and material. Tool holders must be so designed to give adequate support and ample chip and coolant clearance. Summarized, tool presentation consists of proper depth of cut in relation to cutting speed and feed determined by the material hardness.

The fourth factor affecting tungsten carbide useage is grade selection. The correct selection grade is dependent upon the type of material and the type of cut. For hard tough stringy materials such as armor, a tough grade is required. A harder grade can be used for light finishing cuts, a soft grade is required for heavy roughing and intermittent cuts.

This leads us into the fifth and most important factor in tungsten carbide application, i.e., design. To properly design the tool, all the previous factors must be considered; namely, machine, fixturization, tool presentation, and grade selection. Most of the discussion on design will be formed around single point tools, as milling cutters are only a series of single point tools clamped or brazed to a common rotating body.

One of the prime considerations is tungsten carbide's need for adequate support. Inasmuch as tungsten carbide is brittle and has low resistance to bending strains the steel support must take this load. The steel shank under the carbide should be at least three times the thickness

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. . . Diamond-Substitute, from page 88

For offhand tool grinding, the writer is of the opinion that abrasive belt grinding on properly designed machines shows the greatest amount of promise.

For chipbreaker grinding, the Cavitron method appears to have real possibilities, but here, again, a design job on a suitable machine must come first.

Electrolytic grinding will be improved to where it is a satisfactory method, but it is questionable whether or not industry will accept the method. If both electrolytic and abrasive belt grinding can both be improved to where they no an equally satisfactory job in the sharpening of cemented carbide tools, then the average shop will adopt the abrasive belt method because of its greater simplicity.

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. . . Machining Armor Steel, from page 91

of the carbide tool.

Blank sizes should be chosen to conform to available standard shapes, bearing in mind that the heavier the pressure involved, the thicker the tip should be. The nose is the weakest part of the tool and care should be taken to provide sufficient built-in strength to protect this vital part. This is accomplished by the use of the side cutting edge angle which allows the initial shock of the cut to be taken at a point beyond the fragile nose.

The end cutting edge angle should be as flat as possible having just enough angle to allow the tool to clear the work and prevent drag. On armor, this angle has been determined to be five to ten degrees (5°-10°). When the finished part does not determine the side cutting edge angle, a tool with approximately fifteen degrees (15°) side cutting edge angle has been found very satisfactory. This keeps the included angle of the nose over ninety degrees (90°). Clearances and reliefs are generally maintained from six to eight degrees (6°-8°) for reliefs and eight to ten degrees (8°-10°) for clearances.

Rake angles are very important to the cutting action of the tool. Positive rakes will reduce cutting pressures but weaken the tool. For intermittent cuts and heavy duty rough turning, positive rakes cannot be used. This is obvious as with a eight degree (8°) relief and a 0° rake, the cutting edge has less than a ninety degree (90°) included angle. This would allow the edge to chip and fracture. It has been found through experience that the included angle can be maintained at ninety degrees (90°) or more, the tool will stand up and operate under the severe conditions of a heavy roughing or intermittent cut.

Because of the high speeds at which tungsten carbide tools

are used, chip disposal becomes a problem. To facilitate chip disposal, chip breakers become a necessity, not only from an economic standpoint but also from a safety standpoint. This is perhaps one of the most important points to be considered.

Carbide Tool Troubles and Causes

Trouble:
Chipping.

Cause:
"Saw tooth" or too keen a cutting edge.
Chip breaker too narrow or too deep.
Chatter.
Scale or inclusions.
Improper grinding.
Incorrect grade.
Too much relief.
Lack of rigidity.

Trouble:
Cracking or Breaking.

Cause:
Feed too heavy.
Worn or chipped cutting edges.
Improperly applied coolant.
Too much rake or relief.
Too much overhang.
Lack of rigidity in setup.
Speed too slow.
Too much variation in depth of cut for the size of the tip.
Incorrect grade.
Chatter.
Braze or grinding strains.
Built-up edge.

Trouble:
Chatter.

Cause:
Tool not on center.
Insufficient relief or clearance.
Too much rake.
Too much overhang.
Nose radius too large.
Feed too high.
Lack of rigidity in setup.
Insufficient horsepower.

Trouble:
Torn Finish.

Cause:
Speed too slow.
Dull tool.
Chip breaker too narrow or too deep.
Improper grinding.

Trouble:
Wear.

Cause:
Speed too high.
Feed too light.
Incorrect grade.
Nose radius too large.
Improper grinding.

Trouble:
Crater.

Cause:
Speed too slow.
Feed too high.
Incorrect grade.

Trouble:
Glaze.

Cause:
Dull tool.
Feed too light.
Nose radius too large.
Insufficient relief.

Trouble:
Build-up.

Cause:
Speed too slow.
Finer finish grind needed.

To provide safe working conditions for the operator, chips must be produced "Wheatie size" instead of in long strings or streamers. Too much importance cannot be given to this one consideration; chips must be broken. This is accomplished in

. . . Continued on page 98

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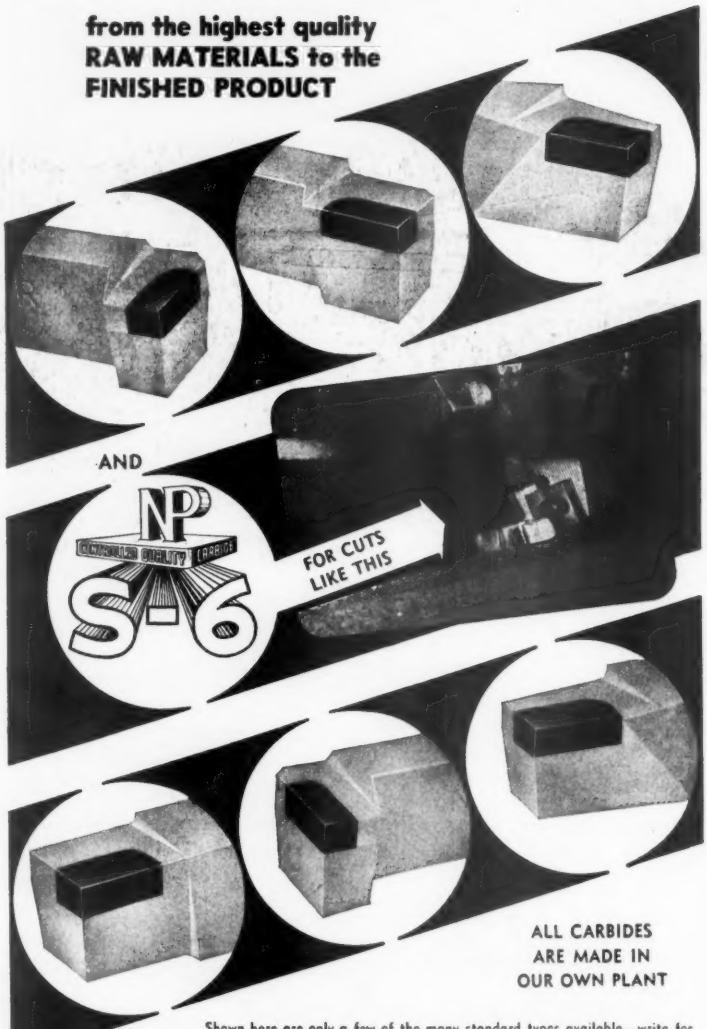

Shown here are only a few of the many standard types available—write for complete catalogue and other technical data.
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. . . Mobile Gages, from page 86

trailer is an unbroken line of cabinets and work counters. Beneath the ceiling cabinets are fluorescent lights that illuminate the counter surfaces. Five overhead lights are recessed in the ceiling between outlets for the air conditioning system. The air conditioning unit, along with the electrically-operated heater, are located behind panels at the front of the trailer. Three thermostats are placed to give even temperature throughout the trailer.

Most of the trailer's equipment is stored in cabinets. There are 86 small gage-testing tools that can be stored in cabinets when the trailer is en route from one plant to another.

Larger pieces of equipment, each of which has its own location, include an Eastman contour projector, Pratt & Whitney measuring machine, three granite surface plates, a Sheffield comparator, a super micrometer, three sets of gage blocks and an internal diameter checker.

As it covers its normal calls on plants of six Ordnance District prime contractors in the state, the trailer's facilities will be made available to smaller contractor-plants near each of the six major Ordnance production centers. The regular driver of the tractor that accompanies the trailer will bring gages in from these smaller plants for testing.

Since a certain percentage of military productive output is scrapped because of defective or rejected components, it is not difficult to visualize how the mobile lab's close and frequent scrutiny of the gages used to check these parts can mean aggregate savings of millions of dollars.

Ryerson Move

Formerly manager of the company's Cleveland plant, William O. Springer has been moved to New York as manager by Joseph T. Ryerson & Sons, Inc., steel distributors. Mr. Springer, a graduate of Purdue University, came to Ryerson from the Babcock & Wilcox Co. Broad administative experience, coupled with his engineering background and years of work with special analysis steels, makes him well qualified for his new post with its larger field of endeavor. His predecessor in N.Y. is moving to Chicago for special duties.

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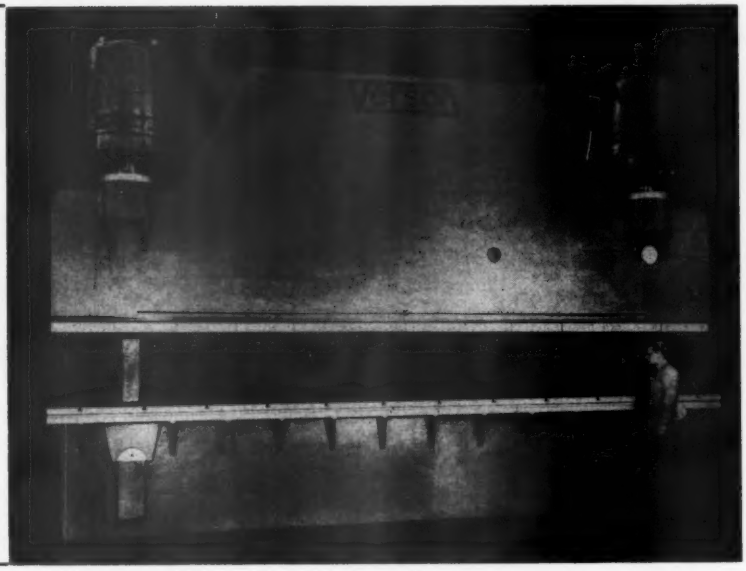

Installation of the largest and greatest capacity hydraulic press brake available for commercial steel fabricating was recently announced by the Republic Structural Iron Works Division of the Consolidated Iron-Steel Mfg. Co., 1290 East 53rd St., Cleveland.

According to Mr. L. S. Cawrse, Consolidated Iron-Steel vice president and manager of the Republic Structural Division, the new press brake has a capacity of 1,000 tons. It bends and forms 1" plate up to 18' long and will straighten 6" plate 18' long. Mr. Cawrse said that the press brake had been produced by the Verson Allsteel Press Brake Company of Chicago.

The press brake's installation will enable enginers to use the machine's commercial steel fabricating abilities to eliminate many welding operations, to plan weldments instead of castings, and to utilize non-standard sized cylinder and structural shapes.

The press brake is 24' long and stands 15' high from the floor with 6' embedded in a huge reinforced concrete foundation. Its total weight is approximately 150 tons.

An idea of the economies made possible by the new installation is found in the example of the time and labor saved on a simple 90° bend with 1" plate, 18' long, as against cutting the plate, clamping the two parts in position, tack welding and then final welding.

To further illustrate the capabilities of this press brake, the following are its major specifications:

Capacity	1000 tons
Distance betwen housings	18' 6"
Length of bed and ram	24'
Shut height, bed to ram, stroke down	16"
Daylight space, bed to ram, stroke up	28"
Stroke	12"
Center of ram to back of gap	16"
Area of bed	24" x 24'

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Differential advance (450 tons)	42"/m
Advance (1,000 tons)	21"/m
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Diamond Grinding Wheels Conference

Fourteen manufacturers of diamond grinding wheels are in agreement that the supply of diamond crushing bort is in a "very delicate" balance with demand.

At a recent special conference with officials of the National Production Authority, Department of Commerce, they admitted uncertainties surround the future supply of diamond bort, especially if defense production should be intensified.

A crisis in the imported supply of diamond bort and powder arose early in 1951, but shipments in 1952 improved the domestic supply and users of diamond grinding wheels now have a 60-day inventory of such wheels. Consumption of bort now is exceeding imports, however, and inventories of the raw material are further receding, NPA was told.

The manufacturers said deliveries of diamond grinding wheels proved adequate to meet American industrial needs in 1952. They agreed deliveries in 1953 also will be adequate if conservation and salvage are rigidly practiced.

The conference emphasized the necessity for increased conservation of diamonds, recovery of diamond grain and reduction of waste by more efficient operation of the diamond grinding wheels. They cited the need for a more durable bond for the diamonds in wheels, avoidance of overheated wheels and of excessive pressure of wheels on surfaces being ground, proper speeds of the wheel and the saving of grinding swarf or sludge.

The meeting developed into a lengthy discussion of the relative merits of diamond wheels and silicon carbide wheels. The manufacturers stated that American industry has been falsely led to believe, by some newspaper and magazine articles, that diamond grinding wheels are likely to remain in short supply and that grinders of tungsten carbide should convert from diamond wheels to silicon carbide wheels.

The diamond grinding wheel manufacturers disputed a claim, made at an October 1952 conference which silicon carbide wheel makers held with NPA, that 90 percent of all tungsten carbide grinding can be done with silicon wheels.

They admitted that silicon carbide wheels have their place for certain applications, but challenged an assumption that they are more economical or more effective than diamond wheels. They said silicon wheels can't be used for internal, form, thread or chip-breaker grinding. Such grinding is possible only with diamond wheels, they pointed out.

Users of diamond grinding wheels should not be "panicky" about the availability of such wheels, the manufacturers said.

NPA officials were optimistic about mastering the problems of abrasive wheels if a full-scale war should arise by applying substitute methods for grinding—electro-erosion, for example—which are now in the development stage.

Members of the diamond grinding wheel manufacturing industry, which grew from a usage of 50,000 carats of diamond bort and powder in 1927 to nine million carats in 1952, praised the effectiveness of Order M-103 in conserving diamond bort.

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Blast Cleaning Eliminates Paint Peeling Problem

By switching from pickling, power sanding and hand methods of cleaning to blast cleaning, Vapor Heating Co., Inc., Chicago, has eliminated a problem of paint peeling on various components of its steam generators, blowers, radiators and other railroad passenger car heating equipment.

In addition, the 8-ft. diameter Rotoblast table-room installed in this plant speeds cleaning operations, simplifies handling and substantially reduces man-hours. The company conservatively estimates that this cleaning equipment is saving them at least 10 man-hours per heating unit.

For each steam generator produced, approximately 25 parts are made ready for painting in the blast cleaning unit. The cleaning operation removes weld slag, shop dirt, mill scale and rust and thus provides a better bonding surface for the paint. Typical parts cleaned include large control cabinets for steam generators, blower housings shown before and after cleaning in Figure 1 and 2, and welded steel coils, Figure 3.

Photos courtesy Pangborn Corporation.

Fig. 1. Before—A table load of blower housings and large steam generators control cabinets are cleaned by Vapor Heating Co., Inc. in its 8-ft. diameter Rotoblast table room.

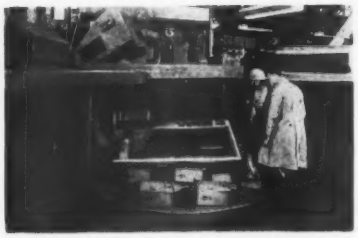

Fig. 2. After—Cleaned parts have satin smooth finish and are free of weld slag, mill scale, rust and shop dirt. Paint does not peel from these blast-cleaned parts.

Fig. 3. The Rotoblast table-room also cleans effectively the multi-surfaced welded steel heating coils.

Cleaning times are: 30 seconds for small, thin pieces; 3 minutes for the harder-to-clean parts; and 5 minutes for the very difficult heat exchanger coils. However, most of the parts are cleaned perfectly in 2 minutes.

These hot rolled and cold rolled steel parts are painted twice —once before assembly, once after—with a special silicone paint. Before the units were cleaned by blasting, both coats of paint were gray. However, the quality of cleaning with the blast unit is so high — it produces a satin smooth, gray finish—that painters, at first, had a difficult time in the touch-up operation distinguishing between painted and unpainted spots. For this reason, the first coat is now tan; the second gray. With the two-color method, each unit is assured of two complete layers of protective paint.

Fig. 4. Table at floor level makes loading easy. To left of Rotoblast table room is a completed Vapor-Clarkson steam generator which will be installed in a diesel locomotive to generate the steam for heating a streamline train.

The blast unit was installed in the cleaning department with its rotating table at floor level. As a result, loading and unloading operations are simplified. Also, the company has eliminated the extra work in cleaning and handling that resulted when parts that could not be finished satisfactorily by pickling and grinding were sent out to a commercial blast cleaner.

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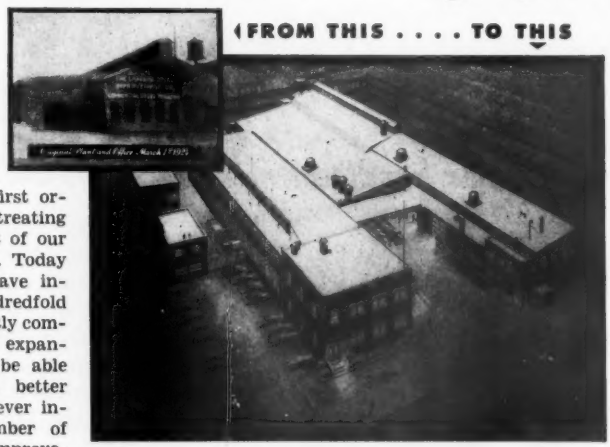

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THE *Lakeside Steel Improvement Co.*

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Manufacturer Gives Customers a Trial Press Run

A trial run of a new 2,000 ton hydraulic press was recently staged by a Chicago Press manufacturer for the Kawneer Co., Niles, Mich., the purchaser of the press. This actual performance demonstration for the Kawneer people gave them a chance to preview their press in action and to witness the construction methods used.

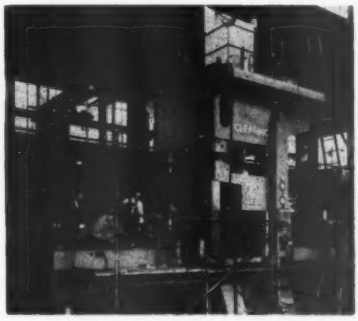

Photo courtesy Clearing Machine Corp.

The new press utilizes the rubber pad, or Guerin principle, for forming, making it possible to eliminate one half of the die members by replacing them with a thick rubber pad fixed in the ram of the press. The rubber pad is surrounded by a metal retainer into which the bolster and punches enter similar to the way a piston enters a cylinder. As the total pressure in the pad begins to approach the pressure behind the press ram, the rubber is forced to assume the die shape and forms the piece-part around the punch. In this way the physical properties of the rubber are put to work forming the part.

Traversing tables on this press work automatically in synchronization with the press stroke. These moving tables permit the press operators to load one table while the other is under the ram. As the press ram ascends, the newly loaded table travels under the ram while the finished parts move out to the opposite side making that table ready for reloading.

A compact control column is placed at the right front side of the press. The operator governs all press operating functions from a convenient master control panel placed on this column.

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Allied Swivel Shoes

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

MEN YOU SHOULD KNOW . . . . . .

DON P. CARR

MICHAEL F. RYAN

LEONARD MOREY

ARTHUR S. ARMSTRONG

FRANK R. ADAMS

★

Don P. Carr has been named assistant sales manager, Steel Division of Firth Sterling, Inc. He came to the company in 1947. Before his recent appointment he was a salesman. He was previously employed by Jessop Steel Co. and Crucible Steel.

The appointment of Michael F. Ryan as production manager of the Yale & Towne Company's Philadelphia plant was recently announced. He was formerly chief process engineer and manager of subcontracting for the company.

At a recent meeting of the board of directors of Morey Machinery Co., Inc., New York 13, Leonard Morey was named president. The company has a background of over 40 years in manufacturing, merchandising and distributing machine tools.

Arthur S. Armstrong has been elected president of the Cleveland Twist Drill Co. He succeeds Jacob D. Cox who assumes the position of chairman of the board. He has been with the company for twenty years, was made executive vice president in 1949.

Frank R. Adams has been appointed field engineer in the Saginaw, Mich. territory by the Bellows Co., Ohio. He was formerly a distributor of cutting tools and mill supplies in this territory. His new offices will be at the Bellows Co., 792 Second National Building, Saginaw, Mich.

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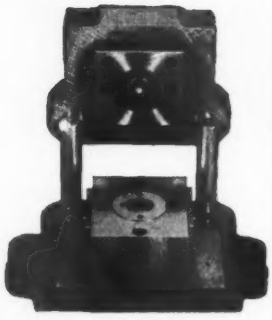

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. . . . . MEN YOU SHOULD KNOW

JOHN F. NEWHARD

E. U. T. BERTHELSEN

K. C. MacKAY

HARRY DAY

GEORGE A. GADE

★

John F. Newhard has been appointed production control manager of the Shakeproof Div. Illinois Tool Works, Chicago. He previously served such organizations as A. O. Smith, Highway Trailer Co. and U. S. Steel in production control and planning capacities.

E. U. T. Berthelsen and K. C. MacKay have been appointed assistants to the vice president and manager of the Shakeproof Div. Illinois Tool works, after long association with the company, Mr. Berthelson since 1933 and Mr. MacKay since 1939. Both men will have offices in Shakeproof's new St. Charles Road plant in Elgin, Ill. The division is nationally recognized in industrial circles for its broad line of improved fastening devices.

Harry Day has been appointed vice president and general manager of the Link Welder Corp., Detroit 27. He has had broad experience in Detroit's metals working, fabricating, and resistance welding equipment industries.

George A. Gade, manager of outside sales for Standard Pressed Steel Co., has been made vice president in charge of sales by the Jenkintown, Pa., firm. He has been with the company since 1939, except for a period of four years during which he was a lieutenent in Naval Intelligence.

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DAYTON 4: The Die Supply Sales Co., 311 Vermont Ave., MIchigan 9691 • TWX-DY-85

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Machining Armor Steel, from page 93

several ways; by the use of a chip breaker ground into the tool, by the use of mechanical chip breakers clamped onto the tool and by using negative rake angles in combination with controlled feeds and speeds. The most commonly used chip breaker is the ground-in type. This can be of two (2) types; a parallel chip breaker or angular one. The parallel chip breaker is formed by grinding the shoulder parallel to the cutting edge. The angular type is formed by grinding the shoulder anywhere from five to fifteen degrees (5°-15°) to the cutting edge. The depth and width of the chip breaker determine the chip size and shape.

To correctly determine the chip breaker design, the feeds and speeds must be considered. The depth of the chip breaker is normally held between .015" and .020". The width of the chip breaker will vary from 1/16 to 1/4 of an inch depending upon the type of material, depth of cut and, feed and inches per revolution. The narrower the chip breaker, the tighter the chip curl; the wider the chip breaker, the looser the chip curl.

The best chip breaker is the widest one which can be used. As the cutting edge is the same as the top of the chip breaker shelf, all rake angles must be ground on the shelf. Quite often in the interest of economy, the rake angle need only be ground on the chip breaker shelf. This serves two purposes, especially with negative rake tools, (1) it conserves expensive carbide and (2) it lowers cutting pressures.

The nose radius affects the operation to a considerable degree. Too large a nose radius will cause chatter and excessive cutting pressure which in turn will cause the tungsten carbide to fracture. Too small a nose radius induces tool chipping and will also leave a thread-like finish on the work piece.

Mechanically attached tips in certain applications are far more efficient than brazed tips. Harder grades of carbide can be used as no brazing strains are set up. The solid insert type offers a great many advantages. For example: a square insert has eight (8) cutting edges which can be used before sharpening, while a brazed tool has only one. The harder grade of carbide also allows more metal to be removed before the tool breaks down and requires regrinding.

Heavier cuts quite often can be used due to the fact that the high compression strength of tungsten carbide is utilized. This gives a broad outline of some of the factors which must be considered in designing and using carbide tools on armor. The chart, Figure 1, shows the basic types of brazed cutting tools

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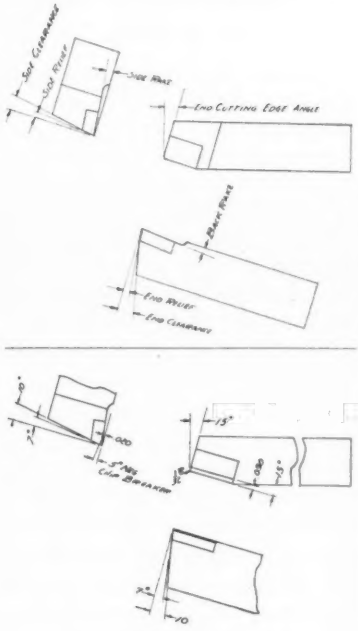
with the depth of cut and speed and feeds used for machining armor steel.

Fig. 1. NOMENCLATURE OF TOOL ANGLES AND RECOMMENDED TOOL GRINDS FOR SPECIFIC PURPOSES.



Even after the tool is designed the job is not finished. A great deal of trouble shooting normally must be done. One of the ways to eliminate excessive trouble shooting is by developing proper handling techniques, not only for the operator, but also, for the grinding room, tool cribs and transport. As has been constantly stressed carbides will not take a great deal of mechanical shock. Quite often a tool failure can be traced directly to faulty handling of the tool.

Perhaps the only way to bring this under control is through educational programs in correct handling of tools. Even dull tools should be handled respectfully as a piece of carbide or a dull carbide tool can have the tip chipped or cracked as easily as a sharp tool. To augument the education of the tool handlers,

. . . *Continued on page 111*

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Successful Shop Methods for Diamond Conservation*

by Thomas A. Ribich
Assistant Superintendent
The Weldon Tool Company
Cleveland, Ohio

Out at The Weldon Tool Company, located at 3000 Woodhill Road here in Cleveland, we are extremely busy these days manufacturing new metal cutting tools of all types, including of course, a great number of tipped and solid tungsten carbide tools. Today, because of the very critical situation that exists in the diamond grinding wheel industry, and also because diamond wheels are the costliest consumable item so necessary to the successful processing of carbide tools, we are operating our Carbide Department under a two-point diamond wheel conservation and salvage program.

First, we are attempting to prolong the life of our existing diamond wheels just as much as humanly possible by the application of every proved method.

Second, we are saving all our diamond wheel stubs and all grinding sludge and swarf, and when a reasonable amount is accumulated, we place this material in the hands of reliable diamond reclaimers, who not only pay us a very resonable price for it, but they return the reclaimed bort to the wheel manufacturers, where it is processed into new grinding wheels.

In regard to extending wheel life, let me explain to you a few of the more important points that we at Weldon have found to be extremely helpful.

1. Educate the employees who are grinding carbide to respect the value of the diamond grinding wheels they are using.

2. Invest in a sufficient number of wheel mounting adapters so that once a diamond wheel is mounted and dressed to perfect running truth, that wheel will remain on that adapter for the balance of its life. Nothing is more detrimental to the life of a diamond wheel than the constant handling made necessary by a shortage of wheel adapters, to say nothing of the waste caused by the dressing that must be done every time the wheel is remounted.

3. All diamond wheels that are 1/8" wide and under should be mounted between sturdy aluminum or steel flanges, with the flanges just as large in diameter and as well balanced as possible. These flanges will eliminate vibration that is always present

*An address given by Mr. Ribich at an Industrial Diamond Clinic and Panel Discussion sponsored by the Cleveland Regional Office, UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL PRODUCTION AUTHORITY, and THE CLEVELAND ENGINEERING SOCIETY.

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Capacity, 45 tons at 100 rpm. of flywheel
Bed Area, 22½" front to back and 26" right to left
Stroke, standard, 3" (can be a maximum of 7")
Distance back from center, 12½"
Distance between gibs, 11½"
Size of shaft at main bearings, 3½"
Size of flywheel, 38" diameter and 750 lbs. in weight
Perkins builds a complete line of presses. View shows a typical installation of Perkins Presses at Acme Chain Corporation, Holyoke, Mass.
PRESSES BUILT TO SPECIAL SPECIFICATIONS
Perkins Power Presses SINCE 1885
PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

in wheels so thin, and in doing so will add considerably to the life of the wheel.

4. Provide pigeon-hole type wood storage racks that will be suitable for safely storing your dimanod wheels after they are properly flange-mounted on adapters. Provide ample clearance in these racks so that when the wheels are placed into them, they nest on their steel adapters and not on the periphery of the wheel. A device such as this will pay for itself many times over when compared to the savings created by the elimination of wheel breakage, and will also serve to invite the proper care of your wheels by the employees who handle them.

5. Limit the amount of stock that may be removed per pass with a diamond wheel, regardless of whether the operation is form grinding, cylindrical grinding, or surface grinding. In general, use roughing wheels of from 100 to 150 grit for roughing, and limit the stock removal to .0015" maximum. The finer grit wheels should be used for finishing, and stock removal with these wheels should be held to .0005" maximum. I do not mean to imply by this that roughing wheels cannot be used for finishing. If circumstances and finish requirements of the job permit, it is perfectly correct to take a light final pass with a roughing wheel to produce the finish. However, it is not considered good practice to use a fine grit wheel for rough stock removal under any circumstances.

6. Whenever possible, have the tungsten carbide form tool tips pre-formed as close as possible to finished size, to eliminate the need for excessive grinding, which in turn will minimize the wear on your diamond wheels. The carbide tip manufacturers will be more than glad to cooperate with you in this respect, and the slight additional cost of preformed tips as compared to standard tips is very definitely offset by the savings in diamond wheel costs alone, to say nothing of the additional savings in hours of high-cost grinding time.

7. Always use sturdy, well-designed and well constructed work holding devices to eliminate as much vibration as possible during grinding operations. Vibration, as all know, is very detrime diamond grinding wheels, and any step we use to prevent it will be adding life to our wheels, while at the same time improving the quality of the work produced.

8. When bringing newly mounted wheels into running truth, always use tried and proved methods. The best general practice to follow in this respect is:

First, place an empty wheel

. . . Continued on page 104

STANDARD CARBIDE MILLING CUTTERS
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Super
TOOL COMPANY
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A Preventive Maintenance Program*

by George J. Martin
Manager, Mechanical Division
NATIONAL BISCUIT COMPANY
New York, N. Y.

In these days of shortages of materials and equipment, and scarcity of qualified maintenance labor executives are in many instances analyzing their maintenance organizations in an effort to obtain maximum results with present personnel and existing production equipment.

Improvement in manufacturing methods during the past ten years have been very remarkable; maintenance procedures, also, have been improved to keep pace with the more efficient plant operations but not on as great a scale. This is due to the primary effort being directed on production. The day of giving verbal maintenance orders and making repairs only when equipment breaks down is gradually disappearing and manufacturing plants in all types of industry are using Preventive Maintenance in part, or as a complete program.

To properly illustrate and define maintenance it may be well to start off by indicating that in industry, either of two forms of maintenance is used:

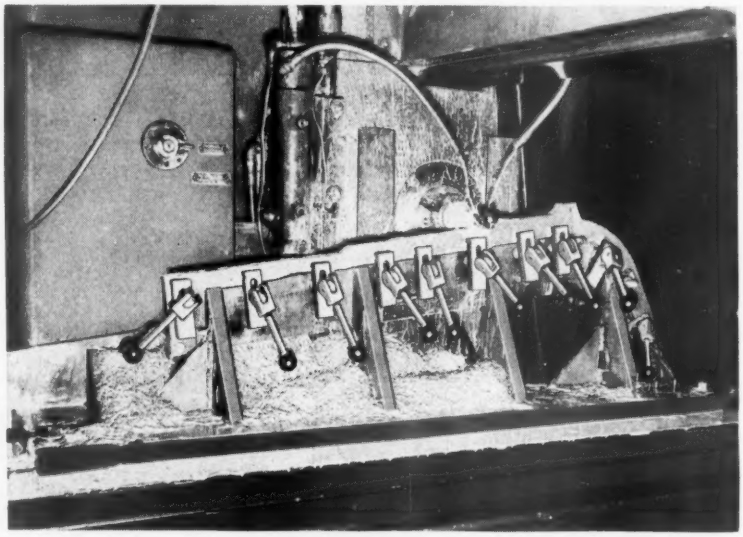
1. Breakdown Maintenance: Making repairs to machinery and equipment when actual failure occurs during a scheduled production period, at which time only necessary repairs to get the equipment into production quickly are made. This form of maintenance is very expensive, inefficient, and it precludes obtaining maximum production.

2. Preventive Maintenance: This is a sound, logical, tested system of planned maintenance to obtain maximum efficiency and production with existing equipment. It prevents breakdowns and shutdowns through systematic inspection of equipment, making adjustments and scheduled repairs before failures occur, and thereby preventing interruptions to production schedules.

For many years management overlooked the methods that were available to reduce and control maintenance expenditures.

The fear that with the installation of new maintenance programs or procedures greater cost would develop, has been found groundless. With the conversion to preventive maintenance by industry over a period of fifteen years, sufficient main-

*Adapted from an address delivered at the Plant Maintenance Conference, held concurrently with the Fourth Plant Maintenance Show, at Cleveland, Jan. 19-22, 1953.



Airplane Canopy Bars Held Firmly by Wespo Cam Clamps for Contour Milling

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Full scale template sheets will be sent on request.

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26935 WEST SEVEN MILE ROAD • DETROIT 19, MICHIGAN

tenance cost data has indicated results and savings much greater than originally anticipated.

Most plants can be operated on a preventive maintenance basis regardless of size or the number of maintenance employees. We have installed maintenance programs in plants having only three maintenance employees and in others with maintenance personnel up to 250 men—the only difference being that the smaller plants have a streamlined program with a minimum amount of paper-work to fit their requirements and smaller maintenance organization.

In plants operating on a three shift, six day basis, a combination of breakdown maintenance and preventive maintenance is occasionally used due to the inability of the maintenance department to shut down vital production units; however, such practices are avoided as much as possible by carrying spare parts, equipment sections and sometimes complete units to make rapid replacements in an emergency.

The benefits of a realistic program cannot be obtained unless management is fully sold on its merits. Efforts to use preventive maintenance by selling the mechanics first and management last only encourages failure. When management has fully approved the installation of a preventive maintenance program, the Plant Engineer should then make every effort to sell the program in advance to his maintenance foremen and leadmen before installing any phases in which the mechanics take part. The results and sucess depend upon the coordinated effort of everyone down the line, from management to the mechanic who makes the preventive maintenance inspections.

It also is important to review in advance with union representatives, the entire program so that possible complaints and grievances will be forestalled. Management, at this point, should also review the entire program with the top production supervisory personnel to acquaint them with the program. We must recognize the fact that the Production Department is fully familiar with the manufacturing equipment, the capacity and volume that they can produce under normal operating conditions, and also knows the weak spots in their production setup; therefore, their cooperation and assistance is essential to assure completeness and workability of a sound preventive maintenance program.

Planning the Program

A good, sound, preventive maintenance program can be developed to suit your particular needs by planning it along cer-

. . . Continued on page 106

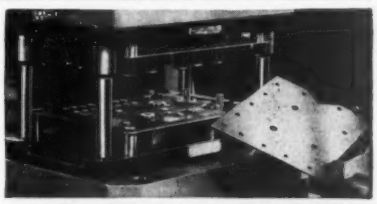
New • Fast • Proven

LOW COST methods for PERFORATING and NOTCHING SHEET METALS

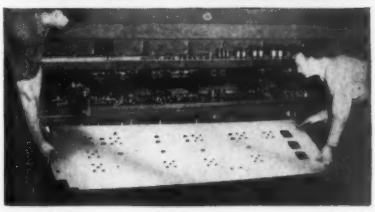
REDUCE DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION**—*Down time is minutes as compared to hours for change-over.* For precision work in all types and sizes of presses. **START PRODUCTION AT ONCE.** Pierce materials up to ¼" thick mild steel. Standard sizes and shapes available up to 3 inches. Special sizes to order.

Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized retainers hold the units. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler *ADJUSTABLE* Dies on perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.



● Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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Adjustable, Magnetic, Custom and Cam Dies for all Industry

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For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

. . . Diamond Conservation, from page 101

mounting adapter on a true running grinding spindle and lock it in place with the spindle nut.

Second, mount the diamond wheel on the adapter, with flanges if necessary, and draw up the locking ring of the adapter to hold the wheel securely but not tight.

Third, place an indicator in position to register the run-out of the periphery of the wheel when the spindle is turned over by hand. By placing a wood block against the periphery of the wheel and tapping it with a light hammer, adjust the wheel to run as true as possible to indicator reading. Remember that the closer you can adjust the wheel to running truth, the less diamond you will have to dress off to bring it into perfect truth. Tighten the adapter locking ring and re-check the run-out to make sure the wheel did not move during the tightening operation. The total run-out at this step in the procedure should not exceed .001".

Finally, dress the periphery of the wheel with the spindle running, by using any one of the several provided devices that are sold for this purpose. At Weldon we are using a unit that mounts a 3" diameter x ½" wide Crystolon wheel on a spindle that is well supported with anti-friction bearings. This unit is firmly mounted on the machine carrying the diamond wheel so that the 3" Crystolon wheel is directly under the wheel that is to be dressed. The dressing is accomplished by starting the diamond wheel spindle and feeding this wheel into the Crystolon wheel. As soon as the diamond wheel contacts the Crystolon wheel it will, of course, cause the Crystolon wheel to rotate, and the resulting crushing action between the two wheels will bring them both into perfect running truth.

9. If you have your hand in the original design of carbide tipped tools, make a real effort to design them so that they lend themselves to good grinding practices. Never bury a carbide tip below the steel backing or in a confined pocket, necessitating the use of extremely small grinding wheels, because these small wheels are difficult to use, and in most cases, very enefficient for stock removal. Keep in mind that for longest wheel life and most efficient grinding, large wheels are best, so promote tool designs to accommodate the largest wheels possible. This will permit your carbide grinding department to get the most out of the costly, hard-to-replace diamond wheels in their possession.

10. Make a hard-and-fast rule to never grind steel with a diamond wheel unless it is absolutely necessary, and even then limit the amount of steel to be

Those Who Know Best

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Engineers and Master Mechanics appreciate the plus-value of Johnson Saws . . . the dual frames mean accurate cutting and maximum blade life . . . the 3-point suspension eliminates twisting . . . the heavy axles, etc., all mean one thing to the engineer—VALUE

MODEL J pictured . . . Cuts 10" rounds, 18" flats. Available as a wet or dry cutting machine.

MODEL B also available, a smaller machine . . . Cuts 5" rounds, 10" flats; furnished with or without casters. Really portable. Can be taken anywhere for on-the-job cutting.

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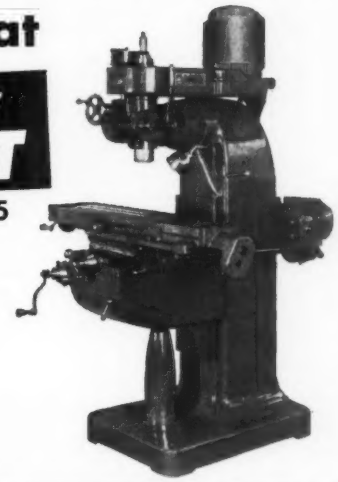
removed to a bare minimum by roughing the steel as close as possible to size with other type wheels before using the diamond wheel. In a great many cases, by careful turning and milling operations on the tool shanks, it is possible to have the carbide project beyond the steel in such manner that the tool can be completely finished without the diamond wheel once touching steel. This, of course, will not only prolong the life of your diamond wheels, but will also minimize the possibility of cracking the carbide tips. To take full advantage of this, we at Weldon make a practice of sending the proper tips for a job directly to the milling department along with the proper steel blanks, so that in the milling of tip pockets the operator has the tips on hand to actually fit for proper overhang. We also check each tool shank or body before tips are brazed in place, to make certain that the carbide will clear the steel sufficiently to eliminate the necessity of grinding steel with our diamond wheels. It is even considered time well spent to remove all excess brazing material and constantan or copper shim stock that protrudes beyond the tip, prior to the grinding operation. This can be done by hand filing or by the use of regular vitrified grinding wheels. Keep in mind that for maximum wheel life, you must make every effort to minimize the amount of material other than tungsten carbide that must be ground with your diamond wheels.

11. The last but most important point I can mention in regard to extending the life of diamond grinding wheels is to use floods of coolants whenever possible, and mist or wicks where there are limitations. There are, of course, times when we at Weldon are compelled to grind dry. I am thinking of cases of clearing or relieving a cutting edge to a hairline land, when coolants in any form would prevent the operator from properly observing his work. Here we can only recommend that very light cuts be taken, to prevent damage to the wheel. We have also been compelled to dry grind on our optical projection machines, where coolants would be thrown off the grinding wheel and cover the optical lens and light source, thereby obscuring the projected tool shadow, making it impossible to grind to layout. However, we are now experimenting with a new mist coolant attachment on our optical grinders that may overcome this difficulty. This mist unit is adjustable to spray almost any medium of coolant in extremely small quantities, and could prove very useful around any machine using diamond grinding wheels. We have tried

. . . Continued on page 108

INDEX
MILLING MACHINES
Pay Off in ACCURACY and TOP PERFORMANCE at
an Amazingly LOW COST
Model 55



Milling, Drilling and Boring need not be expensive . . . Thousands of metal-working plants have learned it . . . Index Mills are the answer . . . Their demand is big and constantly growing. Pictured is the improved VERTICAL MODEL 55, a large capacity, versatile machine . . . Has a speed range of 80 to 2700 RPMs, 1 H.P. drive, 3⅛" quill, extra rugged spindle, capacity of ⅛" to 1½" end mills in tool steel. Spindle quill travel, 5¼". Table 40" x 9" or larger.

VERTICAL MODEL 40
An outstanding machine that has proved itself in highly satisfactory service for 15 years. While it is not a jig borer, it is widely used for accurate boring and locating. The improved spindle drive gives nine spindle speeds, an ample range for all operations. CAPACITY, ⅛" to 1" end mills in tool steel. TABLE, working surface 8" x 26", 8" x 34" overall.

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A simple, efficient machine that in many ways equals or exceeds a light No. 2 in capacity. Designed for the average tool room, but its rigidity and low maintenance cost make it suitable for production shops. Standard table 40" x 9" with larger table optional. Compact and with all operating parts enclosed yet readily accessible. Controls conveniently located for ease of operation.

INDEX MACHINE CO.
541 N. MECHANIC STREET JACKSON, MICHIGAN

. . . Maintenance, from page 103
tain fundamental principles.

The following forms are consistent with the average plant where planned preventive maintenance is being used:

A. Equipment Record

B. Preventive Maintenance Inspection Records

C. Work Orders

D. Maintenance Time Cards

E. Storeroom Withdrawal Order

F. Monthly Report of Preventive Maintenance Inspections

G. Mechanical Downtime Report

As it is necessary to have a complete record of all of the equipment to be maintained and controlled, a requisite in starting your preventive maintenance program is to take a physical inventory of **all** the equipment.

To properly identify each unit, it is necessary that an equipment inventory number be assigned to each; this can be stamped on a metal tag and attached to the unit permanently.

It will simplify the inventory of equipment if a mimeographed form is prepared, with space for listing the general data desired, special information, etc. These sheets can be turned over to area mechanics, electricians or trainee engineers for compiling. In some of our plants, we have assigned the inventory work to our maintenance clerk so that he could become familiar with all of the equipment and be in a better position, when the program is in operation, to handle the various clerical reports pertaining to the equipment items.

Equipment Record. This should be properly designed to cover all possible reference data for all plant equipment, and should indicate the assigned inventory number and the unit's location.

The form should record all pertinent nameplate data, description of the equipment, serial number, manufacturers' name and address, purchase order number, lubrication data, etc.

Space is also provided for listing essential replacement parts to be stocked in the maintenance storeroom for repairs or replacement when required. Maximum and Minimum quantities are established for each of the parts to be carried in stock. When a large variety of parts is to be carried in stock, they can be listed on a separate spare parts list attached to the equipment record.

The reverse side of the equipment record is used for a physical history recording the repairs and changes, indicating the work order number, repairs or changes made, labor and material costs.

After the records are in use for some time, the history of repairs and changes will indicate whether the equipment is

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Dremel Moto-Tools are time-tested—have been widely used in industry for over fifteen years. A veteran of World War II, Moto-Tool served in war plants and at military maintenance bases throughout the world. Thousands of these mighty midgets helped to make the atomic bomb—were used to establish production records in defense industries during the last war. Hundreds of toolroom and production line operations, such as polishing and grinding dies, burring parts, marking tools, sharpening cutters, touch up jobs, etc. are accomplished in seconds, without tearing down "set-ups." Moto-Tool is sturdily constructed for long lasting industrial service. Weighs only 13 oz.— dynamically balanced for vibrationless operation.
MOTO - TOOL KIT NO. 2 contains 23 accessories, including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case $23.50
MOTO-TOOL No. 2, with one emery wheel point $16.50
Dremel HIGH - SPEED STEEL CUTTERS and balanced wheel points are available for all makes of hand grinding tools.
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functioning properly and on an economical basis or if the equipment is too small, too weak, or of the wrong size and type for the job.

The value of this equipment record is limitless. In case of a breakdown, the Plant Engineer can get accurate machine and parts specifications immediately, the name and address of the manufacturer of the quipment, purchase order and date, etc. Whether the question covers size, weight, lubrication, current characeristics, or other operating data, the essential details are there.

Your equipment record file should be started as soon as possible, as it is the basis for obtaining the frequency data for the preventive maintenance inspections and lubrication, which can be indicated in tickler section of the form.

Inspection Records. The Preventive Maintenance Inspection Records comprise a group of forms, specifically designed for the purpose of recording and reporting the findings of the maintenance inspectors. Each record covers a specific class of equipment and contains a pertinent list of inspection points to be checked by the mechanic making the inspection.

It is desirable to develop similar forms to cover the various types of equipment in your plant. The information can be compiled from your equipment records, the selection being made by the Plant Engineer by carefully considering the location of the equipment, its value in maintaining production, frequency of inspections, and maintenance workload. The number of inspection record forms should be kept to a minimum because inspection of unimportant equipment on a too freqent basis could decrease interest and reduce the benefits of Preventive Maintenance.

(Continued next month)

Swivel Shoe Sets for Jigs and Fixtures

These new swivel shoe sets, developed by Allied Air Parts, 662 N. Robertson Blvd., Los Angeles 46, Calif., are adaptable to jigs and fitures and will hold the workpciee without marring or burring its surface. Their construction insures concentricity between swivel shoe and screw threads.

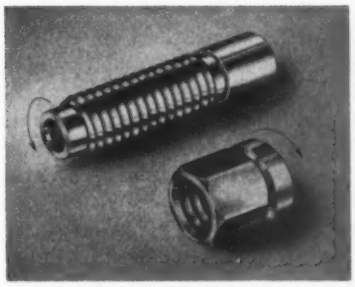

Illustration shows (above) the SS style which is a socket head screw with swivel shoe attached, for use in close quarters, and (below) the HS style, a hexagon swivel shoe to be used on any type or length of screw.

FRAY VERSATILITY MOVES WORK FASTER!
Fray NO. 10RH
UNIVERSAL RAM • TURRET TYPE • VERTICAL & HORIZONTAL
MILLING MACHINE
Speed up production by cutting job transfers with the versatile Fray 10-RH. This all-purpose milling machine performs an unequalled range of operations, cuts idle machine time and produces more work per man hour. It machines at any angle—vertical, horizontal or both. It mills, drills or bores at any angle. On any single piece of precision work requiring a variety of operations it is easier to reset the Fray than to transfer the work. For faster jobs, done better at less cost—investigate the easy to operate Fray 10-RH. A High Precision Tool.
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For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.
All-Angle
FRAY MACHINE TOOL CO.
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. . . Diamond Conservation, from page 105

it with water, kerosene, light oils, heavy oils, and soluble mixtures, but as yet have not carried our experiments far enough to reach any specific conclusions. Attachments of this type, along with oil saturated wicks, are very helpful in prolonging the life of diamond wheels, and also make it unnecessary to equip your tool room grinders with expensive and bulky coolant catch basins. Along with the benefits afforded your diamond wheels, you will find a definite improvement in the quality of surface finish when coolants are applied, regardless of the method of application.

It is a very simple matter to install a wick to apply coolant or lubrication to a diamond wheel. Obtain a small sheet of ⅜" thick hard felt, which comes in various widths and thicknesses and is sold by most supply houses, and cut this sheet into strips approximately ½" wide and 4" long, using a band saw or a sharp knife. Improvise a method whereby the surface of one of these strips can be held against the periphery of the diamond wheel, even if it means clamping the strip to a wheel guard or bracket with a small C-clamp. Saturate this felt strip, which is in contact with the wheel, with kerosene, light spindle oil, or one of the liquids sold especially for use with diamond wheels. This felt will not only deposit one of these cooling mediums on the wheel, but it will also act as a cleaning brush and prevent the wheel from loading or clogging. When the felt has worn, it can be changed to a new position very easily. With such a simple, yet effective, method of extending wheel life no one using diamond wheels can afford to overlook the application of coolants in some form or another in their grinding operations.

In regard to our salvage program, we feel that for a start we have had excellent returns on the sale of our diamond wheel stubs and the sludge from our wet grinders. I can honestly say that with very little effort on our part we have realized an approximate 15% return on the cost of the diamond wheels that were used up on our wet grinding equipment. The sludge which was removed from our coolant tanks during routine maintenance of our equipment was simply accumulated in a metal container, and when we had approximately 66 wet pounds of it on hand, it was sent to one of the recommended diamond salvaging concerns. A short time later we were informed by this concern that our sludge contained .523% diamond and was worth $12.00 per dry pound, or a total of $652.56!

I might add that it took about

. . . Continued on page 123

MODEL RC-250

Swedish Craftsmanship!

CUTTING ECONOMY ... with SAJO Hydraulic Hacksaws

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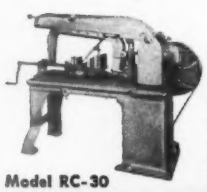
ATTRACTIVE PRICES

Another Swedish contribution to lower manufacturing costs! SAJO Power Hacksaws, produced by Sweden's largest Hacksaw manufacturer, are available in three models — all Hydraulic — designed to meet the needs of the small, medium or large metal-working plants. Operation is simple and foolproof. Modern design, sturdy construction and painstaking workmanship put SAJO on a par with the finest in hacksaws. Their modest cost represents an outstanding value in this type of metal cutting equipment.



Model RC-30

Write for literature and prices on:
Light Duty Model RC-30, 6" x 6" capacity
Medium Duty Model RC-45, 9" x 9" capacity
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Each machine carrying the Austin seal is sold with the manufacturer's full guarantee and our positive assurance of user's satisfaction. Replacement parts — in stock.

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DEALERS IN PRINCIPAL CITIES

Pressed Metal Institute Annual National Technical Meeting

The stamping industry's Fourth Annual Spring Technical Meeting, held under the auspices of the Pressed Metal Institute, opens at the Hotel Carter in Cleveland on March 25th and closes March 27th.

The Pressed Metal Institute with headquarters at Shaker Square, Cleveland, Ohio inaugurated these technical sessions three years ago, and from the outset they have attracted engineers and executives of the pressed metal industry from coast-to-coast. This year's attendance will reach a new high of over 300.

The technical subjects are selected annually upon industry interest and are presented on a panel basis with nationally known speakers, and in most cases they tie closely with the Pressed Metal Institutes's programs of the Technical Research and Standards Committee whose Chairman is Warren Peterson, Peterson Products Corporation, Chicago, Ill.

The 1953 program as a tie-in with a national safety campaign being conducted by PMI's Safety Committee (headed by Mr. G. Glenwood Rose of Judson & Rose, Inc., Philadelphia, Pa.) includes a full day devoted to safety. The days' theme will be "Safety at the Press", and the morning's session will be on "Press Guarding". The afternoon's panel will discuss "Designing Safety Into Dies", and the nationally known authority, Mr. J. I. Karash of the Reliance Electric Co., Cleveland, Ohio will head this panel.

The highlights of the opening day include a comprehensive exhibit of the latest types of safety devices exhibited through the courtesy of the manufacturers of these items.

The second day will include the following subjects: "The Right Press for the Right Job", and "Drilling, Tapping & Counterboring in the Stamping Plant".

The concluding day's sessions open with "Work Simplification" presented by Allen Mogenson of New York City. He is well known for the Work Simplification Conferences which he presents at Lake Placid, and he will explain and illustrate some of the principles of "Work Simplification" which he teaches at these conferences. The concluding session will be "Die Breakage and How to Minimize It".

Mr. Tom Campbell, Editor of Iron Age, will be the speaker at the Friday luncheon. Mr. Campbell is well known among stamping manufacturers and members of the Pressed Metal Institute for his accurate predictions made at previous meetings of PMI. The National Program Committee for this Fourth Annual Spring Technical Meeting is headed by Mr. C. C. Caditz of Northern Metal Products, Chicago, Ill; and is comprised of the following individuals: Mr. James M. Leake of The Leake Stamping Company, Monroe, Mich.; Mr. Frank Humberger, Technical Metal Processing, Inc., Cleveland, Ohio; Mr. Phil Wood, The Acklin Stamping Company, Toledo, Ohio and Mr. C. Glenwood Rose, Judson & Rose, Inc., Philadelphia, Pa. This meeting, although sponsored by the Pressed Metal Institute, is open to all companies in the industry. In addition, suppliers to the industry are also welcome. An innovation this year is an invitation extended to the teaching personnel of engineering schools and colleges.

Complete details regarding registration fees and program may be secured from the Pressed Metal Institute, 2860 East 130th Street, Cleveland 20, Ohio.

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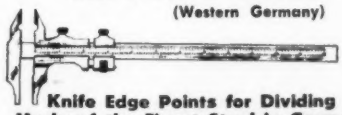

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Made by C. Stiefelmayer (Western Germany) of the Finest Tool Steel. With Non-removable Setscrew.

Graduated on both sides to read, by means of a vernier, in thousands of an inch. One end is of conventional design, and the other is equipped with a thin rod which can be used either way by reversing beam. The bottom surface of the base is 4" x ¼"; blade 25/64" wide.

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Ordnance Production Story

A 16mm movie on the production of steel cartridge cases has recently been relased by Clearing Machine Corp., Chicago press manufacturer. This color movie with optical sound track takes you into Rheem Mfg. Company's plant near New Orleans, La. Here you will see the press operations necessary to transform a flat steel disc, 8⅞" in diameter and .690" thick into a streamlined cartridge case 24" long. A new type of hydraulic press draws top billing in the film. It departs from conventional design in that it is a horizontal press with two slides. While one slide is on its return stroke, the other performs an operation at the other end of the press. Film available from Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.

SHELDON
CHICAGO
PRECISION LATHES
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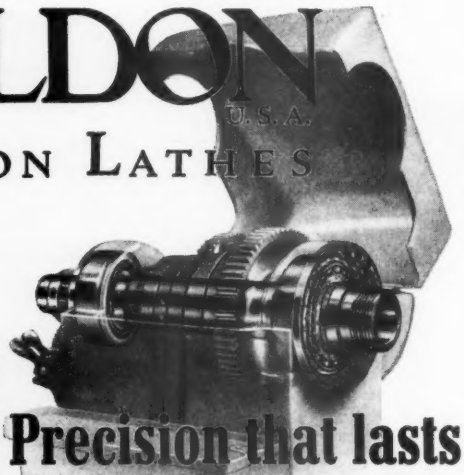

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"Stamina" Features:

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- Full Double-Walled Aprons—all gear shafts supported on both ends
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.

No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

Write for Catalog

SHELDON MACHINE CO., INC.
4235 N. Knox Ave., Chicago 41, Illinois

"Metering" Carbide Tool Wear

A new device for controlling wear and limiting breakage of carbide tools has recently been developed by a manufacturer of indexable blade solid carbide milling cutters and lathe tools.

First, the meter is constructed with an auxilliary red pointer which can be set by the operator or by supervision at the point at which a tool is dull and should be changed. Industry has pretty well established that a dull tool pulls from 50% to 100% more power than a sharp one. The meter reduces this generality to pinpoint exactness for a particular tool on a specific job.

Photo courtesy Detroit Milling Cutter Company.

This meter shows when a cutting tool is dull and needs replacing. Its scale is zoned: green meaning the machine is operating up to 100% of rated motor capacity; yellow, 100% to 125%; pink, 125% to 150%; and red, above 150%. An auxiliary red hand can be positioned at the point, as disclosed by experience, where a specific tool on a given job becomes dull.

On milling applications, particularly on shifting from high speed to carbide cutters, or where different jobs are being put across the same machine, the meter is invaluable in quickly establishing a feed rate within the machine power limitations.

When used in connection with the company's indexable solid carbide milling cutter blades, the meter insures an even wear on the eight or sixteen cutting corners. This saves carbide and reduces grinding costs.

. . . Armor Steel, from page 99

properly designed boxes and handling devices become a necessity. These boxes should be designed to prevent banging of tools into each other. They should be made of wood or some other inert material such as plastic. After tools are ground, if the tips are protected with thermo-plastics, damage in handling can be greatly reduced. Carelessness causes more damages and more inoperative tools than is generally realized.

Another aspect of preventive trouble shooting is to have all the tools characterized on paper so that the grinding room knows exactly how to grind them, thus insuring repeat performances. After all normal precautions have been taken, trouble may still be encountered on the job. It must be remembered that each specific application of a cutting tool is different and presents its own set of problems. The most common troubles encountered along with the possible causes and remedial actions are listed throughout these pages, together with photographs of tools showing the trouble and the remedial action taken.

Magnetic-Feed Punch Press

Fractional horespower motor laminations are punched out at 135 strokes per min. on this magnetic-feed press at Westinghouse Small Motor Div., Lima, Ohio. Blanks, stacked in the vertical index feeder, are picked off by magnets, positioned, stamped, and moved along by power.

Electronics in Industry

How electronics save time, money, and prolong the life of heavy machinery was recently demonstrated at the 20th national exposition of Power & Mechanical Engineering, at Grand Central Palace in New York City. In an exhibit involving boiler and power plant operation, closed circuit television chains were shown monitoring unattended equipment. Also shown as a working demonstration was an electronic metal detector for the protection of automatic machinery. Results of scale, corrosion, and fatigue studies were portrayed with an electronic microscope, a table model of which was operating at the exhibition.

The RCA Victor Division of the Radio Corp. of America, currently engaged in a well-developed research program in applying electronics to increase industrial production, was responsible for these exhibits.

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FIXTURE CLAMPS
and COMPONENTS
DEPENDABLE . . . . DURABLE
FIXTURE CLAMPS—widest range, in the industry, of sizes and types to fit every requirement.
Jack Locks . . . Cam Locks . . . Hand Knobs . . . Hand Wheels . . . Steel Ball Handles . . . Soft Chuck Jaw Blanks . . . Fixture Cams . . . Set-up Studs . . . Rest Buttons and Rest Pads . . . Spherical and Plain Collar Nuts . . . Quarter Turn Screws . . . Fixture Keys . . . Spherical and Flat Washers . . . Shoulder Screws and many other items. Complete assemblies or individual parts.
Write for Catalog of most complete line in the industry. Full size tracing templates of each product. Economize with MORTON.

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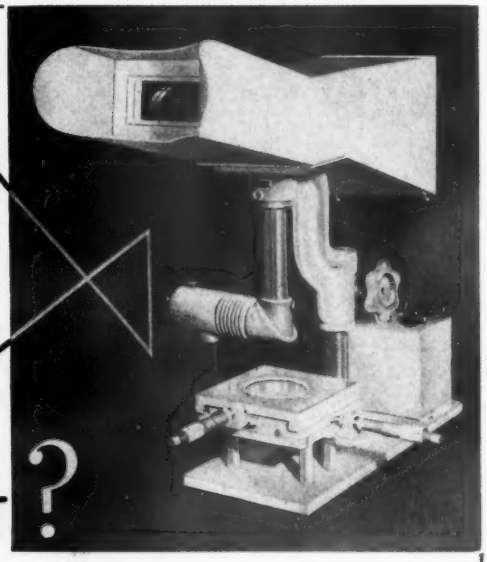
PUBLICATION

Model B-1 Flex-Tester Non-Destructively tests sheet metal to determine its comparative drawing qualities and its stretcher strain characteristics. A new folder from Steel City Testing Machines, Inc., 8843 Livernois, Detroit 4, Mich., has all operating characteristics, data, and instructions. The complete test procedure requires only about 1 minute.
Circle Inform-A-Gram No. B1.

Dial Indicator Test Set has range of .030" with graduations of .001", features rotable dial, reading in either direction from zero, and readings may be taken through 180° arc of the contact ball and arm. Made in England, distributed by De Witt Equipment Co., 136 Lafayette St., New York 13, N. Y., from whom further data is available on application.
Circle Inform-A-Gram No. B2.

HOW BIG IS BIG?



As Big As The Engineering Skill offered by Stocker & Yale.
This Optical Comparator, Small in Size is Serving America's Greatest Industries. 250 Stocker & Yale Projectors check the Quality of General Electric Instruments at their "World Headquarters for Electrical Measurements", West Lynn, Mass.
What is your Inspection Problem?

Write for Projection Brochure—Contains 10 Applications Stories

Stocker & Yale INCORPORATED | MARBLEHEAD MASSACHUETTS

New Diamond Grit Tool makes big cut in thread grinding costs. Selected diamond grits in a special alloy matrix give effective cutting life until the tool is used up. Lighter dresses are effective, wheel life increased, and more pieces produced between dressing. Grits are selected for each specific type of thread grinding operation. Full data from the Wheel Trueing Tool Co., 3200 West Davison Ave., Detroit 6, Mich.
Circle Inform-A-Gram No. B3.

20 to 50 Percent Longer Life is given by the "Texrope" grommet v-belt. A new bulletin, No. 6497A, from the Allis-Chalmers Mfg. Co., 1013 S. 70th St., Milwaukee, Wis., has all engineering data. This belt is the only one at present made without a splice, and is cooler running, shock obsorbent, has one-third the stretch of other belts, and offers less slip and more grip.
Circle Inform-A-Gram No. B4.

Drill Head Production Reaches 23,000 Pieces a day in one application of Dumore automatic drill heads to drilling a .026" diameter by .069" depth hole in tiny brass parts. Drill life per grind extended over same number of workpieces. Full data from the Dumore Co., 1313 Seventeenth St., Racine, Wis.
Circle Inform-A-Gram No. B5.

Manufacturing Cost Control is title of a new folder available from the Harold F. Howard Co., 319 Fisher Bldg., Detroit 2, Mich. Included are break-down charts, cost control forms and performance curves that show how the management of modern metalworking plants can cut costs with adequate manufacturing cost control systems.
Circle Inform-A-Gram No. B6.

Selecting the Right Stainless Steel and using it to best advantage is only one of the critically important subjects which are completely covered in new 124 page stainless steel handbook from Allegheny Ludlum Steel Corp., Dept. TP-37, Oliver Bldg., Pittsburgh 22, Pa. Clear and concise fabrication data, comprehensive listings of analysis, properties and characteristics also will help you speed production and cut waste by specifying the right grade for your job.
Circle Inform-A-Gram No. B7.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

A Full Line of Arrow End Mills, which now include a new heavy-duty single-end type with three to six flutes available is described in a colorful new folder from Arrow Tool & Reamer Co., 418-422 Livernois, Detroit 9, Mich. Instant selection for your need is made possible by graphic tabular layout. Fully illustrated.

Circle Inform-A-Gram No. B8.

You Can't Gouge Work Surfaces if your jigs and fixtures are fitted with new 'Swivel Shoes' by Application Div., Allied Air Parts, 662 North Robertson Blvd., Los Angeles, Calif. As soon as pressure is exerted during the clamping process rotation of the precision ground shoe or pressure pad is stopped, permitting the screw or bolt to be securely tightened without moving or damaging the held part. Hexagon nut with shoe is available for any type or size screw, complete set for use in limited space.

Circle Inform-A-Gram No. B9.

"Ovens for Industry" is title of new brochure No. 520 now available for the first time from the Lanly Co., 750 Prospect Ave., Cleveland, Ohio. It's well illustrated and organized, and gives a complete picture of some of the most modern units now being manufactured. If you have a heating problem or question, you'll find your answer here.

Circle Inform-A-Gram No. B10.

Specializing in External and Internal Grinding, honing and superfinishing, and having complete toolroom and production facilities, Martin Grinding & Machine Works, Inc., 2234 West Walnut St., Chicago, now have a booklet ready for distribution that provides full information on their contract services.

Circle Inform-A-Gram No. B11.

If You're a Production Man you'll be interested in increased life expectancy of insulated electrical equipment; less maintenance; less machine downtime for motor failure and similar troubles; and increased power output from your existing motors. This is no pipe dream. You owe it to yourself to read the latest booklet on class H silicone insulation from the Dow Corning Corp., Midland, Mich.

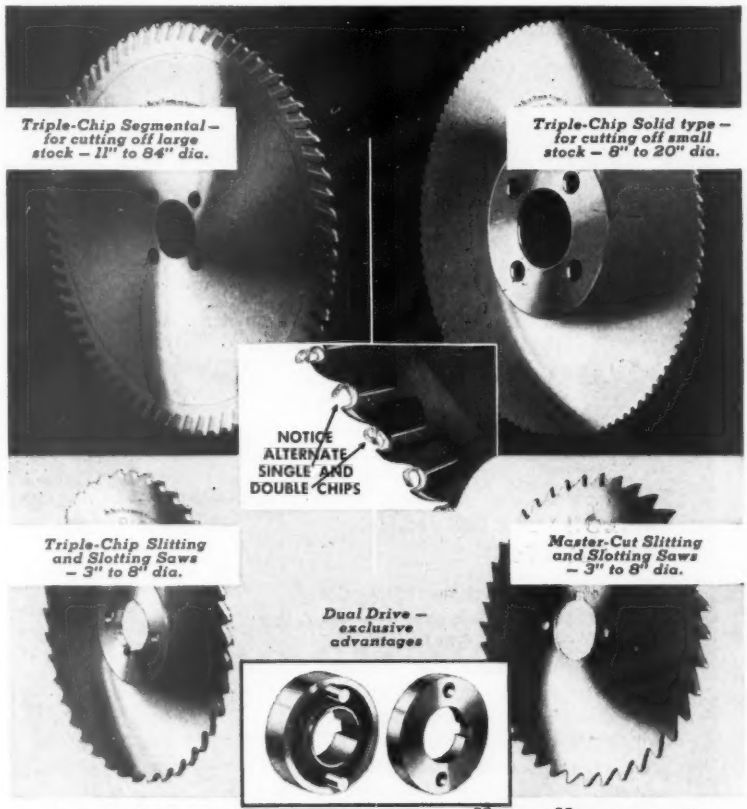
Circle Inform-A-Gram No. B12.

At Your Disposal! An electronically governed grinder with a capacity of 10" diameter and 48" long work has been added to the machinery for contract purposes at the plant of Barth Stamping and Machine Works, Inc., 12650 Brookpark Rd., Cleveland 29, Ohio. A current company catalog details contract tool and die, special machine and production work now undertaken.

Circle Inform-A-Gram No. B13.

Many Quality Design and Engineering Features go into the construction of the type SS totally-enclosed explosion proof motors which are the subject of bulletin 1784, just released by U. S. Electrical Motors, Inc., P. O. Box 2058, Los Angeles 54, Calif. The bulletin is extremely colorful, and gives a complete graphic picture of the unit's outstanding features and application possibilities.

Circle Inform-A-Gram No. B14.


Triple-Chip Segmental — for cutting off large stock — 11" to 84" dia.
Triple-Chip Solid type — for cutting off small stock — 8" to 20" dia.
NOTICE ALTERNATE SINGLE AND DOUBLE CHIPS
Triple-Chip Slitting and Slotting Saws — 3" to 8" dia.
Master-Cut Slitting and Slotting Saws — 3" to 8" dia.
Dual Drive — exclusive advantages

TO CUT OFF STOCK, SLIT OR SLOT, THE MOTCH & MERRYWEATHER TRIPLE-CHIP SAW BLADE OFFERS MANY EXCLUSIVE ADVANTAGES

Fast, burrless cut-off and slitting or slotting with with Dual Drive which makes stresses and breakage negligible. Let M & M Triple-Chip saw blades give you the higher *production-with-accuracy* which Industry must attain and maintain today. Also Master-Cut conventional type with M & M's exclusive Dual Drive. Ask your dealer.

★ ★ ★

ALSO TRIPLE-CHIP ANTI-WELD SOLUBLE OIL

For the most favorable results, time- and profit-wise, use Motch & Merryweather's superb coolant. Anti-weld, averting pick-up. Sharper tools and longer-lived. Oily, but not "greasy". Smokeless, odorless. A real aid to money-making production.

Triple-Chip METHOD

THE MOTCH & MERRYWEATHER MACHINERY CO.
715 PENTON BUILDING • CLEVELAND 13, OHIO

...IT'S THE COST PER CUT THAT COUNTS...

Only M & M Builds ALL 3: CIRCULAR SAW SAW BLADE BLADE GRINDER

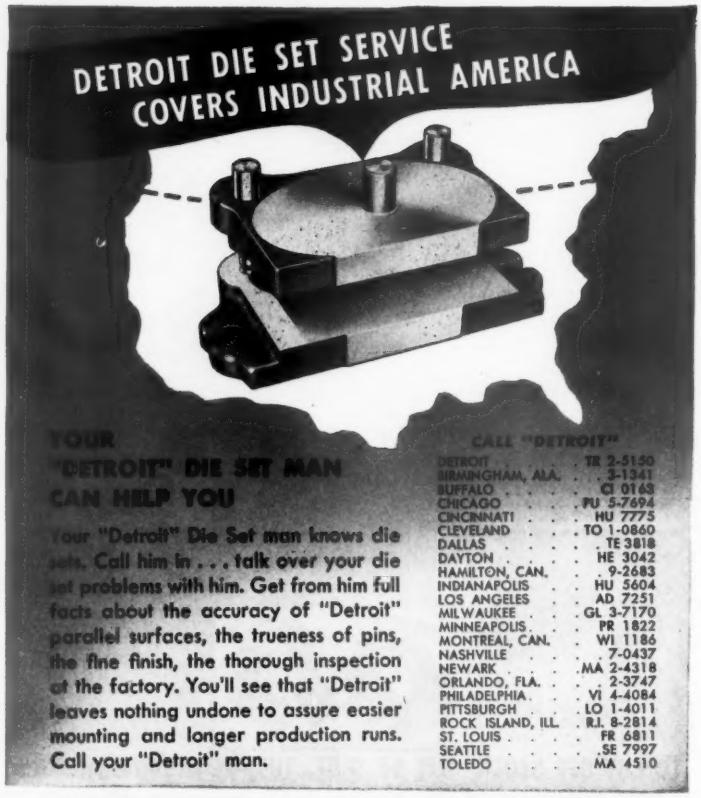
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Dust Collector Catalog from Torit Mfg. Co., 317 Walnut St., St. Paul 2, Minn., has all information and engineering data on a complete line with installations for any condition.
Circle Inform-A-Gram No. B15.

Motorized and V-belt Driven Spindles for grinding, milling, and boring machines are featured in literature available from Pope Machinery Corp., 261 River St., Haverhill, Mass. In the Pope line there is a spindle for almost any application and situation.
Circle Inform-A-Gram No. B16.

Filter and Cyclone Type Dust Collectors are the subject of a bulletin now available from Hammond Machinery Builders, 1631 Douglas Ave., Kalamazoo, Mich. Bulletin describing best application to your specific problem now ready.
Circle Inform-A-Gram No. B17.

High Speed Inspection. An exhaustive line of dial indicator gages is described in literature from Tubular Micrometer Co., Box 50, St. James, Minn. The company is pleased to be consulted on production inspection problems.
Circle Inform-A-Gram No. B18.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Your "Detroit" Die Set man knows die sets. Call him in . . . talk over your die set problems with him. Get from him full facts about the accuracy of "Detroit" parallel surfaces, the trueness of pins, the fine finish, the thorough inspection at the factory. You'll see that "Detroit" leaves nothing undone to assure easier mounting and longer production runs. Call your "Detroit" man.
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DALLAS TE 3818
DAYTON HE 3042
HAMILTON, CAN. 9-2683
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MILWAUKEE GL 3-7170
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ROCK ISLAND, ILL. RI. 8-2814
ST. LOUIS FR 6811
SEATTLE SE 7997
TOLEDO MA 4510
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.
DETROIT DIE SET ★

Features, Applications, and Specifications of the Pratt & Whitney line of vertical shapers are all contained in a catalog now available from the manufacturer, West Hartford 1, Conn. Tool room, die shop, and repair shop applications are fully discussed. Also comprehensive and interesting sections on operating characteristics and features and auxiliary equipment.
Circle Inform-A-Gram No. B19.

'Helix' Screw Thread Pitch gives instant reading of threads per inch of any screw from 48 tpi to 8 tpi. It's completely accurate, very inexpensive, and a great time and trouble saver. No calculations involved. Detailed literature is now to be had from the O-Vee Spring Gage Co., 2516 West Vernon Ave., Los Angeles 8, Calif.
Circle Inform-A-Gram No. B20.

Dry Process Tumbling Barrels are described in a new bulletin LS-52 from Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y. Application data, information on sizes, drives, controls, and liners, and specific abrasive recommendations are all included. A specification table also gives standard model numbers, dimensions, and number of compartments per barrel.
Circle Inform-A-Gram No. B21.

Kutmore Adjustable Hollow Mills will perform any combination of turning, tapering, facing, chamfering and trepanning in one pass, feature micrometer adjustment for rapid setup, and have cutting capacities from 1/32" to 2" diameter in standard stock. Full data in catalog 20TD from Carl Wirth & Son, Inc., 1625 Clifton Ave., No. Rochester 5, N. Y.
Circle Inform-A-Gram No. B22.

Sheet Steel Separator is described in a new catalog sheet now available from the Basco Mfg. Co., 5 Woodside Rd., Stamford, Conn. Data includes description of two units. Model number, height, width, depth of base, weight, number of magnets, maximum height of stack and capacity of units are all fully detailed.
Circle Inform-A-Gram No. B23.

Finish Grinding Single Point Carbide Tools without diamond wheels is described in a new folder from Bay State Abrasive Products Co., Westboro, Mass. A new Bay State wheel grade has been specially developed for the job, and it is described together with complete use instructions in the new folder.
Circle Inform-A-Gram No. B24.

New Tools in Revised Catalog. '53 catalog from Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif., reveals standard rivet sets, some with revised dimensions, others reduced in number to obtain a better choice of shanks for better gun driving efficiency. Gun and squeezer driving data relative to rivet size has also been added. New tools for efficient installation of dowel pins and rivet removal also described.
Circle Inform-A-Gram No. B25.

How the Dust from 27 Grinding Wheels in the tool room of a leading manufacturer of compressors is being controlled by a standard, pre-tested Dustkop dust collector is described in bulletin 637 from the Aget-Detroit Company, 213 Main St., Ann Arbor, Mich. Bulletin describes how time and money was saved in installing the collector, also gives the principal features of the Model 90N50.
Circle Inform-A-Gram No. B26.

Master Collets and Feed Fingers for progressive screw machine plants are featured in bulletins from Hardinge Bros., Inc., Elmira, N. Y. These are the only master collets without work pressure on the screw. Feed fingers feature adjustable tension with a simple turning action to best meet all feeding requirements.
Circle Inform-A-Gram No. B27.

All the Best Features of your existing machine are retained when you fit tracer control equipment by Tracer Control Co., 595 E. 10 Mile Rd., P. O. Box Q, Hazel Park, Mich. In addition to permitting retention of original accuracy, normal cutting speeds, and not interfering with normal machine operation if required, this unit controls two feeds simultaneously. Catalog has complete data on machining profiles and contours on production basis.
Circle Inform-A-Gram No. B28.

Positive Advantages of New Tool Holder include adaptability to all standard engine and turret lathes, component boring adaptors, vertical adjustment without moving bit in holder, and elimination of shims for height adjustment. The unit repeats to within .0003", over any number of tool bits or operations. Bits may also be removed for sharpening without altering set-up. Fuller data from George E. Kirkelie Co., 8717 Darby St., Northridge, Calif.
Circle Inform-A-Gram No. B29.

Lacey Die Set Machine enables the die-maker to complete a die set at his bench, saves on toolroom and handling costs. It's a low first cost, one-handed operation press. Write Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn.
Circle Inform-A-Gram No. B30.

The Ultimate in Special and Standard Cutting Tools, meeting exacting production requirements are featured in literature from the Gairing Tool Co., 21227 Hoover Rd., Detroit 32, Mich.
Circle Inform-A-Gram No. B31.

Cam Making and Jig Boring Contract Service is now available from the Bloomfield Tool Corp., 30 Farrand St., Bloomfield, N. J. This company is at present running 12 jig borers.
Circle Inform-A-Gram No. B32.

Grinding Machine Dog Booklet has recently been published by Ready Tool Co., 55 Iranistan Ave., Bridgeport 5, Conn. It features adjustable and reversible dogs, milling machine dogs and driver, and hold downs. The booklet is well set out for easy reference.
Circle Inform-A-Gram No. B33.

Like IKE and MIKE...they look alike!

Remember Ike and Mike, the two comic characters whom the eye couldn't tell apart?

Here are two bushings, to the eye identical. But right there the resemblance ends.

At the right is an ordinary good bushing of carbon water hardening tool steel. At the *left* is an A·B·C bushing of chromium or chromium tungsten oil hardening tool steel of 18.5% greater wear resistance.*

And to insure that the finer qualities of this premium steel are capitalized to the full, this like all A·B·C Bushings, has been heat treated in a continuous, electronically supervised operation in which every step, including quenching, is under a protective blanket of neutral atmosphere.

This extra A·B·C precaution insures high wear resistance right out to the initial working surface. That is why

A·B·C Bushings last *at least* 18.5% longer

To this add that they are *unexcelled for accuracy and concentricity.*

*See "Special American Machinist Report to the Metal Working Industries"
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HEADLESS PRESS FIT
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REPRESENTATIVES IN ALL IMPORTANT INDUSTRIAL CENTERS
WRITE FOR LITERATURE AND NAME OF YOUR LOCAL DISTRIBUTOR

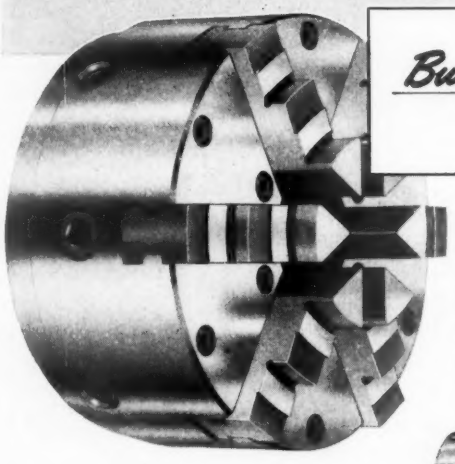
Collets, Speed Collet Chucks and Collet Index Fixtures are described in current literature from Hardinge Bros., Inc., Elmira, N. Y. Complete accuracy, durability and radically increased production potentialities characterize.
Circle Inform-A-Gram No. B34.

More Than 40 Models of Stationary and Portable Toggle Clamps are illustrated in the latest catalog from Detroit Stamping Co., 344 Midland Ave., Detroit 3, Mich. The line includes models with holding pressures up to 4000 pounds.
Circle Inform-A-Gram No. B35.

New Gage Checks ID's and OD's, is not affected by dimensional design changes, since it is adjustable and will accommodate any design changes as they occur. Full data from Boice Mfg. Co., Staatsburg, N. Y.
Circle Inform-A-Gram No. B36.

Clamps in 15 Types and 100 Sizes and more than 350 fixture parts are featured in literature from West Point Mfg. Co., 26935 West Seven Mile Rd., Detroit 19, Mich. The manufacturer will supply full scale templates.
Circle Inform-A-Gram No. B37.

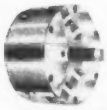
FASTER PRECISION CHUCKING
AT MUCH LESS COST!



Buck AJUST-TRU CHUCKS

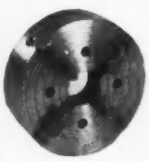
Lines up dead true in less than a minute. Rechucks to .0005 precision at scroll chuck speeds. Ends most needs for collets, step-collets, mandrels, stub arbors. Does the work of over $1,000 in special equipment, at no premium in price. It's the most revolutionary development in 50 years. Send for full details.

Buck 6-JAW CHUCK
WITH 6 EXTERNAL, 6 INTERNAL JAWS
4", 5", 6", 7½" DIAMETERS



Buck 3-JAW CHUCK
In 4", 5", 6" and 7½" diameters. 3 external, 3 internal jaws. Complete line of adapters for all Ajust-Tru chucks.

BUCK TOOL COMPANY
218 SCHIPPERS LANE • KALAMAZOO, MICH.



NEW SUPER-GRIP 4-JAW
INDEPENDENT CHUCK FOR 9" to 16" LATHES
Most chucks for 9" to 16" lathes are either too light and cheaply made to hold work securely, or too heavy for the lathe and clumsy to handle. Here's the happy medium — a chuck with ideal weight, providing much more "holding power" from its ⅛" larger diameter, finely threaded screws. Also eliminates ⅝" overhang . . . improves accuracy . . . permits heavier cuts. 6", 8" and 10" models. Send for latest catalog.

Non-Destructive Testing, its materials, methods, and applications, is described in catalog No. 147 from the Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill. Seven different principles cover just about any application you could have in mind. They detect defects and make invisible imperfections visible on a production, single piece, or job lot basis with equal readiness and economy. Brochure is easy reading and very stimulating.
Circle Inform-A-Gram No. B38.

Die Casting Aluminum and Zinc Alloys is facilitated and made more efficient with "Ajaxomatic", a new combination holding furnace and pumping unit. A folder from Ajax Engineering Corp., Trenton, N. J., has photos of the unit in operation, the control cabinet, and installation diagrams. Also detailed operational data.
Circle Inform-A-Gram No. B39.

Short Turning Radius, Easy Finger-Tip Control and ample power assure fast safe stacking with the "Powrworker" stackers, pallet and platform trucks, and tug tractors by Industrial Truck Div., Clark Equipment Co., Buchanan 162, Mich. Catch up and save with modern materials handling. Detailed literature now ready.
Circle Inform-A-Gram No. B40.

Anyone Can Use the Vibraton, which is an instrument for vibration analysis and dynamic checking, and will locate and correct unbalance even in completely assembled machines where all components are run in their own mountings. New brochure on No. 652 shows how costs can be cut and time saved in production, inspection, maintenance, research, detection and testing applications. It's available from the International Research & Development Corp., Columbus, Ohio.
Circle Inform-A-Gram No. B41.

Hovis Washer Dies Eliminate all process engineering, all tool designing, and all die making and tryout, will produce any type washer in the same die merely by changing five small and easily removable parts. Highly irregular stampings may also be produced without difficulty, merely by ordering special sets of parts on which the company is always glad to quote. Current catalog has all data, is available from Hovis Screwlock Co., Box G, 8100 East Nine Mile Rd., Van Dyke, Mich.
Circle Inform-A-Gram No. B42.

'Di-Profiler' is new triple action hand tool that will rotate, oscillate, or reciprocate by simple adjustments. Stroke is adjustable from 0" to ¼". The tool attaches to standard flexible drives, uses needle and diamond files, or any of a variety of other attachments. Can cut die finishing time by 50%. Full details from Nord International Corp., P. O. Box 44T, Denville, N. J.
Circle Inform-A-Gram No. B43.

Small Investment, Big Savings are offered by a number of machine shop accessories described in bulletin TP-52 from Acro Metal Stamping Co., 330 East Reservoir Ave., Milwaukee 12, Wis. Automatic lubricators, die set pullers, leader pin oilers and drill rod racks are typical.
Circle Inform-A-Gram No. B44.

3 Models comprise the line of Rosa 12½" overhang, single-spindle floor type drilling machines by Parker Machine Co., Inc., 158 Pioneer St., Brooklyn 31, N. Y. Capacities in cast iron range from 1¼" to 2", the two smaller models having infinitely variable spindle speeds, the larger 6 speeds. Full data from the manufacturer.
Circle Inform-A-Gram No. B45.

Metals Cold Treatment with a new "T" series of units having temperature ranges to —200° F or lower is described in a series of bulletins just off the press for Bowser Technical Refrigeration, Terryville, Conn. Valuable information is included on specific applications of cold treatment to the better and more efficient manufacture of improved products.
Circle Inform-A-Gram No. B46.

New Schedule of Hack Saw Blade Sizes, to conform with recently adopted industrial and international revised standards, is announced by Clemson Bros., Inc., Middletown, N. Y. These standards reduce overall blade inventory by eliminating duplication. Further information and complete catalog literature is available from the company, manufacturer of Star blades.
Circle Inform-A-Gram No. B47.

New Service to Precision Casting Foundries. For the first time stainless, "super" stainless, and alloyed tool steels specifically developed for remelting purposes are available. Full data is contained in a new brochure from Cannon-Muskegon Corp., P. O. Box 506, 2875 Lincoln St., Muskegon, Mich.
Circle Inform-A-Gram No. B48.

Gluing, Coating, Cementing and Laminating Machines are subject of new brochure just published by Potdevin Machine Co., 285 North St., Teterboro, N. J. There's a machine in this brochure suitable for almost any application.
Circle Inform-A-Gram No. B49.

A Selection Chart from Graymills Corp., 3713 N. Lincoln Ave., Chicago 13, Ill., has all data in quickly graspable form on coolants and coolant pumps. The company has 38 standard models of coolant pumps and units.
Circle Inform-A-Gram No. B50.

Helpful Data on Die Sets and Die Maker's Supplies is contained in latest catalog from Superior Steel Products Corp., 2754 S. 19th St., Milwaukee, Wis. Special safety features are built into the die sets by this company.
Circle Inform-A-Gram No. B51.

Grinder Design and Construction, coolant systems, controls, automatic setups and attachments are the subject of a new catalog from the DoAll Co., Des Plaines, Ill. Gives the complete picture on a newly revised line.
Circle Inform-A-Gram No. B52.

Severance REGRINDING SERVICE

RECONDITIONING TO *New Tool* PERFORMANCE AT A FRACTION OF *New Tool* COST

HIGH SPEED *We Regrind* MIDGET MILLS • ROTARY FILES BURRS • COUNTERSINKS • COUNTERBORES END MILLS • MILLING CUTTERS • REAMERS **CARBIDE**

AMERICAN MAJOR INDUSTRIES FINDS IT PAYS

American Major Industries are now sending their dull cutters to Severance for regrinding because they know (1) strategic material is being conserved (2) quick deliveries are assured (3) their reconditioned tools will give new-tool performance, and (4) their production costs are lowered. This SEVERANCE SERVICE is paying-out for others — It will Pay you too!

At SEVERANCE, New-Tool Craftsmen, using the same precise skill and care that they do in grinding new tools, regrind your cutters. Send in your dull cutters today!

SEND YOUR DULL CUTTERS TO

Severance TOOL INDUSTRIES INC.

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SAGINAW, MICHIGAN

OUR COMPLETE CATALOG IS YOURS FOR THE ASKING!
IT INCLUDES LOW REGRINDING PRICES.

Complete Tooling Reference is contained in Firthrite Handbook, from Firth Sterling Steel & Carbide Corp., 3113 Forbes St., Pitts 30, Pa. One of the best sintered carbide cutting tool users handbooks.
Circle Inform-A-Gram No. B53.

Exhaustive Line of Carbide and High Speed Steel Tool Bits is featured in new for '53 catalog from Whitman & Barnes, Plymouth, Michigan, U.S.A. Graphically illustrated, complete data.
Circle Inform-A-Gram No. B54.

New Catalog from Schupack Supply Co., 7331 Cottage Grove Ave., Dept. M2, Chicago 19, Ill., contains details and prices on a range of supplies ranging from rotary cutters and burs to safety goggles and hand grinders. It's now available to readers.
Circle Inform-A-Gram No. B55.

Press Brake & Stamping Press are Combined in the new press type brake by the Cyril Bath Co., 6933 Machinery Ave., Cleveland 3, Ohio, giving great versatility and speed. Full catalog type information is now available from the manufacturer, graphically illustrated, with complete eng'g. data.
Circle Inform-A-Gram No. B56.

Check Nut
This is a VLIER Torque Thumb Screw
A trouble-free holding tool that properly supports work pieces against machine tool pressures and automatically prevents their distortion due to overtightening. This assures you of precision machining of even fragile parts.
It Works Like This...
The free-rotating head contains a ball check that works against accurately controlled spring pressures. Upon arriving at the pre-determined holding pressure, the head rotates freely and prevents overtightening of the screw. "Tight is tight enough!"
And These Are the Mechanical Details
Body thread is National Coarse Series Class No. 1 fit. Check nut provided on most sizes prevents backing off under chatter. Holding pressures range from 0-50 lbs. Accuracy and uniformity guaranteed. Made of hardened and rust-proof selected steels. Nothing to wear or break.
Available in Four Types
1. Regular—Type A—for normal supporting.
2. Inverted—Type B—Reverse of Type A support.
3. Tee Head—Type C—used with sliding V-Blocks.
4. Adjustable—Type D—set your own holding pressures.
There is a nearby Vlier distributor to serve you. Write today for complete catalog which includes Spring Plungers, Spring Stops, Fixture Keys and Toggle Pads.
VLIER
VLIER MANUFACTURING COMPANY
Manufacturers of
Toggle Pads, Spring Plungers, Spring Stops, Fixture Keys
4552 Beverly Boulevard, Los Angeles 4, California

Safety and Press Speed Increase with automatic loader. The Lodac press feeder is described in a current catalog from the Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill. Punch press speeds on redraw operations increase 10% to 60% over hand feeding, with operator safety completely assured by removing the operator from the press feed job. Speeds of up to 1,200 parts per hour are attainable.
Circle Inform-A-Gram No. B57.

Quick Tool Change is one of the many features incorporated in the Samson offset boring chuck by Last Word Sales Co., 18500 Mt. Elliott Ave., Detroit 34, Mich. Complete information is contained in current catalog. Other features include precision radial adjustment with large dial, positive dead centering without chuck removal.
Circle Inform-A-Gram No. B58.

New Work Holding Method and Automatic Loader are features of the new Landis 4" concentric grinding machine which is described in bulletin CX-52 from the Landis Tool Co., Waynesboro, Pa. Rings for precision mechanisms and bearing races can be ground to close limits of concentricity of the external surface to the bore on this machine. Bulletin includes a description of the machine, its operation, and condensed tabular specifications.
Circle Inform-A-Gram No. B59.

A "One-A-Month" Information Kit describing permanent magnet application ideas for industry has been announced by the Carboloy Dept. of G. E. Co., Detroit 32, Mich. The basic "kit" is a heavy permanent binder with six application ideas, each described on a separate loose leaf page. Each month Carboloy will issue a new sheet for addition to the kit to all who request it now.
Circle Inform-A-Gram No. B60.

Latest Ford Rotary Tools Catalog has illustrations and specifications on 363 shapes and sizes of carbide and high speed steel items. For the first time chatterless countersinks and solid carbide end mills and grinding burs are shown. Operational data included features a "grade of cut" chart and recommended operating speed chart. This catalog is designed for easy, swift reference. M. A. Ford Mfg. Co., Davenport, Iowa.
Circle Inform-A-Gram No. B61.

Machine Tools, Cutting Tools, and Gages are featured in a new Pratt and Whitney catalog called 'Precision Workmanship'. Selections representing the P & W line in each of these fields are given, including comparators, electro-limit and plug gages, tracer controlled milling machines, jig borers, lathes, and different cutters. The catalog is attractively constructed, makes for easy reference.
Circle Inform-A-Gram No. B62.

Diamond Compounds in Carbide and General Polishing Grades are discussed in literature from the Elgin National Watch Co., Abrasives Div., Dept. D, Elgin, Ill. Polishing costs of less than 2¢ per die and a 20% reduction in lubricating compound cost, together with better product finish have been recorded by a leading producer of tubing products.
Circle Inform-A-Gram No. B63.

Fixed Limit Plug Gaging is accomplished more easily and more accurately—checking not only dimensional accuracy but also revealing taper and out-of-round. 70 to 80% lighter than conventional plug gages of same dimensions. A complete size range is available. Full data from Standard Gage Co., Inc., Poughkeepsie, N. Y.
Circle Inform-A-Gram No. B64.

Precision Metal Stamping Case Histories are featured in a new quarterly publication just issued by John Volkert Metal Stampings, Inc., 222-34 96th Ave., Queens Village 8, L. I., N. Y. Story of how precision stampings "shoot" the picture onto the television screen is highlighted. Mailing list now being compiled.
Circle Inform-A-Gram No. B65.

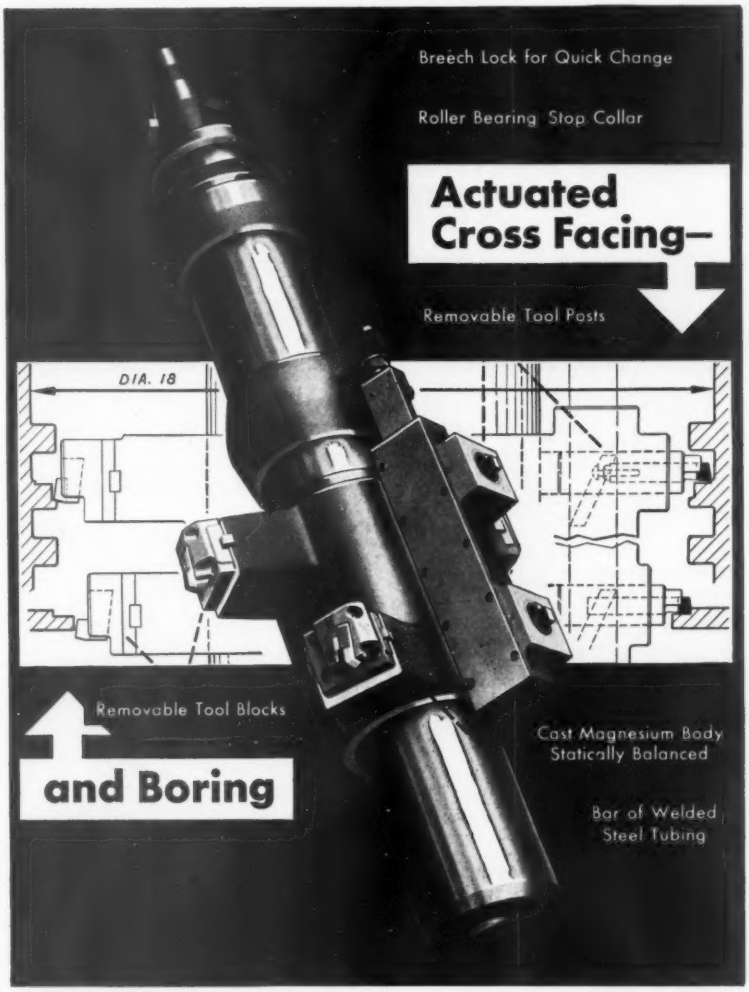
Two Working Ends Are Boasted by the Koch Test Indicator, one of which tests outside surfaces, the other inside. Low first cost. Plunger moves away from rather than towards the lever to protect delicate parts from shock. Scale graduated to .001". From Andrew Genales, Nyack, N. Y., A-28 Second Ave.
Circle Inform-A-Gram No. B66.

Tracer Guided Engraving is subject of a new brochure from New Hermes Engraving Machine Corp., 13-10 University Place, New York 3, N. Y. If you want information on the possibilities afforded by this machining method, on applications, equipment, and accessories, you should get your copy right away.
Circle Inform-A-Gram No. B67.

Diebel Automatic Presses are constructed from the drawing board on up with the express design of guaranteeing maximum die life, protection, and production. A brochure with details on the complete line is now available from Di Machine Corp., 2708 W. Irving Park Rd., Chicago 18, Ill.
Circle Inform-A-Gram No. B68.

Tramrail Systems, Cranes, and Transfer Bridges are described in detail in a new 8 page bulletin from the Forker Corp., 2044 Random Rd., Cleveland 6, Ohio. All operational features are given, plus instancing of standard installation and accessory practice. This bulletin could solve your materials handling difficulties.
Circle Inform-A-Gram No. B69.

Techniques for Motorizing Cone Driven standard or special machines are the subject of a newly released catalog from Western Mfg. Co., 3400 Scotten Ave., Detroit 10, Mich. Included are specifications for transmissions for plate and platform mounting.
Circle Inform-A-Gram No. B70.



TOOLING by GAIRING

Top machine tool builders rely on GAIRING to design and produce the cutting tools that make their special machines perform their best under the most exacting production requirements • GAIRING'S reputation with these leaders in metal-working has been earned by over 35 years of service to the industry • You too may well rely on GAIRING for *your* requirements in both special and standard cutting tools. Ask us to have our nearest representative get in touch with you

The GAIRING TOOL COMPANY • 21227 Hoover Road • Detroit 32, Michigan

Jergens Sine Fixture Keys reduce layout process time and milling costs in generating fixture key slots. 50% of layout time and 5 out of 7 milling operations are eliminated. Bulletin No. 4 from Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, Ohio contains full details.
Circle Inform-A-Gram No. B71.

R3 Bond Rubber Raceway Wheels by the Carborundum Co., Dept. TP 81-33, Niagara Falls, N. Y., have coarser grit sizes for faster more economical cutting, also maintain contours better. However, finish is still high because of special bond. Full data is now available.
Circle Inform-A-Gram No. B72.

No. 3 Hand and Power Feed Milling Machines from Crowningshield-Harris Co., Greenfield Mass., are described in catalog sheet now prepared for distribution. These machines are simple and functionally modern in design, suitable for a wide variety of light production milling machines, and are low in cost. 12 spindle speeds with standard equipment.
Circle Inform-A-Gram No. B73.

This Man Knows How To

CUT COSTS TO THE CORE
SPEED ASSEMBLY JOBS
MEET URGENT SCHEDULES
RELEASE MANPOWER
FOR MORE IMPORTANT WORK

He Uses DPS Power-Driven Assembly Equipment

HOPPER UNITS
Motorized . . . Selects and feeds Screws, Screw Blanks, Rivets, Pins, Nuts, Discs, Washers, etc. in a given position for primary and secondary operations. Eliminates manual handling of parts. Highly adaptable to Presses, Centerless Grinders, Thread Rolling and Slotting Machines and Special Machines.

POWER SCREWDRIVERS
An absolute necessity in present-day production assembling. Will drive screws as fast as one a second—no marring of heads or stripping threads . . . All screws driven to uniform tension. Hopper fed . . . SCREWS ALWARYS IN SIGHT OF OPERATOR. 3 models to fit varying requirements.

You Can Benefit Likewise: Your First Step Is to Mail This Coupon

DETROIT POWER SCREWDRIVER CO.
2827 WEST FORT ST., DETROIT 16, MICHIGAN
Send your catalog and further details.
Company Name
By
Street Address
City State

DETROIT POWER SCREWDRIVER CO.

Chip Protection Without Visibility Loss is afforded by the Dilley magnetic grip-shield, a convenient composite of Alnico permanent magnet and special tru-vision plastic shield. This device mounts immediately in any position on any machine, is fully described in latest literature from the Dilley Mfg. Co., 1656 Ansel Rd., Cleveland 6, Ohio.
Circle Inform-A-Gram No. B74.

Five Flywheel Styles for superior cutter performance on milling machines are featured in latest catalog from Lovejoy Tool Co., Inc., Springfield, Vt. Instanced are applications where tool life was increased more than ten times. Other advantages include reduced horsepower requirements, improved finish and elimination of chatter. Mount any machine.
Circle Inform-A-Gram No. B75.

'Pantography' is title of new booklet just released by George Gorton Machine Co., 1201 Racine St., Racine, Wis. The newest developments in this completely accurate and labor conserving process are fully discussed. Two or three dimensions, horizontal or vertical, single or repetitive work as big as a dime or a dinner table, it's all the same to the pantograph.
Circle Inform-A-Gram No. B76.

Between 4 and 6 Cuts Can Be Made in One Operation with the universal fly cutter by New-Field Machined Parts Co., 210 W. 7th St., Los Angeles 14, Calif. Uses standard HSS or carbide bits, is also very useful for slotting, surface and straddle milling, gear, disc, and gasket cutting. Full size range in latest literature.
Circle Inform-A-Gram No. B77.

Brochure "Precise Production" from the George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., contains catalog type information on twenty or more famous name European machine tools which were shown at the recent Hannover Machine Tool Fair. Optical measuring instruments, jig borers, hobbing machines and ram type universal millers are typical selections.
Circle Inform-A-Gram No. B78.

Manual "The Circuit Rider" just reprinted, presents a down-to-earth discussion, together with drawings, of basic designs in fluid power circuits and indicates the wide range of operations made possible through application of such circuits. It's now to be had from the Logansport Machine Co., Inc., Logansport, Ind.
Circle Inform-A-Gram No. B79.

Precision Straight Edges and Surface Plates by Willison Precision Scraping Co., 790 E. Washington Blvd., Los Angeles 21, Calif. are hand scraped for accuracy. A new catalog sheet now ready for distribution; has all data and prices on the complete line. A new dovetail straight edge by this company will reach machine ways that a bridge type will not touch. Built in support pads and special design features neutralize the effect of temperature changes on stability.
Circle Inform-A-Gram No. B80.

'Star Dust' Diamond Wheels and Hones are featured in new catalog C6 from Ace Abrasive Laboratories, 250 W. 57th St., New York 19, N. Y. Also included is complete information on the other company products, such as diamond lapping compounds and powders. Special bonds give minimum loading and maximum durability for work with carbide.
Circle Inform-A-Gram No. B81.

Diamond Wheel Conservation. Resinoid bonded silicon carbide grade wheels applied to fixed feed carbide grinding was recently investigated by the Norton research staff. Results of their work are summarized in a paper now available from the Norton Co., Worcester 6, Mass., technical bulletin #521. Findings were that in some applications—which are given detailed coverage — subsitution of silicon carbide could give completely satisfactory results.
Circle Inform-A-Gram No. B82.

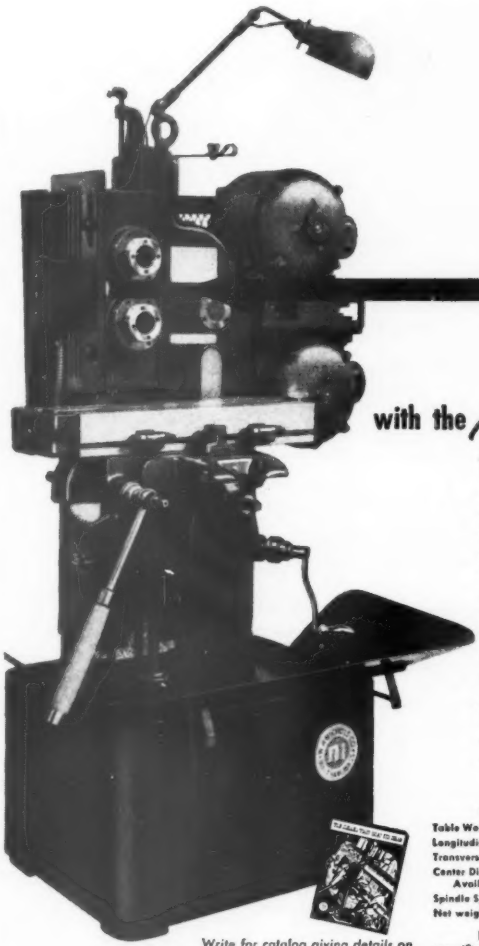
Minimize Maintenance Handling Costs with efficient, modest first cost hydraulic lifts from Big Joe Mfg. Co., 900-910 W. Jackson Blvd., Chicago 7, Ill. Both manual and power models are included in the line, which will handle weights to 750 or 1000 lbs., to heights of 54, 68, or 80 inches. Complete data is now available from manufacturer.
Circle Inform-A-Gram No. B83.

Sajo Hydraulic Hacksaws are available in three models designed to meet light, medium, or heavy duty requirements. Simple operation, sturdy construction and first rate workmanship combine with modest cost. Capacities from 6" x 6" to 10" x 10". Literature from Austin Industrial Corp., 76-X Mamaroneck Ave., White Plains N. Y.
Circle Inform-A-Gram No. B84.

Modest First Cost and Proven Design are incorporated in the two models of hardness tester for superficial and standard Rockwell tests by Clark Instrument, Inc., 10208 Ford Rd., Dearborn, Mich. Choice of 8", 12", or 16" capacities. Cost includes a complete accessories set. Literature now available.
Circle Inform-A-Gram No. B85.

Shop Hints for Extending Diamond Wheel Life are given in a new booklet from the Norton Co., Worcester 6, Mass. Grade, job selection, proper mounting and complete procedure recommendations are given. A section headed "Don'ts" shows graphically just what should be done for good results.
Circle Inform-A-Gram No. B86.

#1100 Hybco Tap Grinder will accurately grind chamfers of taps and core drills, also sharpen flutes and spiral points of taps. Capacities from #0 machine screw to 1½" hand taps. Full data on excellent design and engineering features from Henry P. Boggis & Co., 704 East 163rd St., Cleveland.
Circle Inform-A-Gram No. B87.



TWO FOR ONE

with the *Nichols* Double-Decker!

The Nichols "Double-Decker" Two-spindle Miller actually gives you two milling operations in one pass! It is equally adaptable to small or large lot production of small parts where parallel flats or grooves, or opposed faces cannot be straddle milled, or otherwise must be indexed for two operations with a single cutter. Its time-saving features are readily apparent. Spindles may be separated from 4" to 7" (or more) to accommodate various sizes of cutters and work. Table can be arranged for hand operation or with automatic work cycle, and with high or low spindle speeds.

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Travel	10"
Transverse Travel	7"
Center Distance of Spindles Available Between	3¾" and 14½"
Spindle Speeds Available	up to 5000 R.P.M.
Net weight approx.	1250 lbs.

Inquiries must be submitted in detail, as specifications and capacities are governed by user's needs.

Write for catalog giving details on lever, screw and air-feed models, plus three types of double spindle Nichols Millers.

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION 76-X MAMARONECK AVE. WHITE PLAINS, N. Y.

Telephone Lines for Automation*

by John Straky
Plant Engineer, DeSoto Division
CHRYSLER CORPORATION
Detroit, Mich.

With the coming of Automation in the Automotive Industry, we find that we have to change our maintenance techniques somewhat. For instance, in Machine Shops such as our Engine Plant we find that where machines previously performed one operation or perhaps several, the equipment was confined in relative small areas, and when two maintenance men had to perform services on this machine they were within hearing or seeing distance.

With the new transfer equipment which is in some cases 100 ft. long, and where we have a combination of this equipment, the service men are as much as several hundred feet apart, so that they can neither hear nor see each other. Because of this condition we found it necessary to install a communication system for the ease of servicing this equipment.

Another good example is in our Body Plant. Our Body in White, Paint and Trim operations covers an area of approximately 300,000 square feet. In this area we have approximately eight miles of conveyor. This total length of conveyor is divided into 56 separate conveyors. Transfers between these conveyors is completely automatic involving quite a complex electronic control system. Here again we found it necessary to install a communication system between our Central Control Panel, which operates the entire system, and the four maintenance stations throughout the system.

We have 70 telephone jacks scattered in this area for the various journeymen who plug in their head sets, and communicate with the Central Panel. With our Electronic Control System, the Central Control Operator can tell where our conveyor stoppages are, and the nature of the stoppage. He in turn relays this information to one of the four stations to dispatch a service man to the point of trouble. The service man can also communicate with each other between the various conveyors.

These communication systems permit us to maintain a very smooth operation with a minimum amount of down time.

*An excerpt from a talk which Mr. Straky gave at the 4th Plant Maintenance Conference. Mr. Straky was Discussion Leader of a Round Table on "Maintenance in Automotive Plants."

* Here's what the plant manager at Avey Drilling Machine Co., Cincinnati, has to say about Standard's Twin Wheel Tool Grinder:

"Any grinder that stands the punishment that we give it here at Avey must be a good grinder. All day long, day after day, we grind Carbide tipped lathe tools including boring, cut-off forming, and other high-speed steel tools. Maintenance has been only routine. Down time . . . none. Its economy is amazing."

Why not install a Standard Twin Wheel grinder in your plant? Available in 10" and 14" wheel sizes, wet or dry. No spray or splash when wet grinding. Two operators can grind at once. Conserves floor space. Write for Bulletin TW.

standardize with . . .
the STANDARD electrical tool co.
Mt. Hope & Sixth Sts. • Cincinnati 4, Ohio

SEE US AT BOOTH 660, WESTERN METAL CONGRESS
MARCH 23-27, LOS ANGELES

. . . Diamond Conservation, from page 108

ten months to accumulate the 66 pounds of sludge, and that the machines contributing to the accumulation were used primarily for grinding carbide with diamond wheels under a full flow of soluble oil and water coolant.

Since we are now conscious of the value of this sludge, we intend to be as careful and as thorough as possible about accumulating it, and I would not hesitate to say that the added effort should increase our returns 20% of the value of the wheels used on our wet grinding equipment.

However, our first real attempt at salvaging swarf from our other grinding equipment has not been so successful. We used our central collector, into which is conducted not only swarf from carbide grinders, but also swarf from machines grinding high-speed steel with vitrified wheels. Samples taken from this central collector indicated a diamond content of less than one-tenth of one percent, which is below the one-tenth of one percent minimum at which the swarf is considered worthy of salvage. To overcome this understandable difficulty, we are trying small unit collectors located as close to our carbide grinders as possible, which will collect swarf from carbide grinding operations only, and we are hoping to get results equal to those of our wet sludge. Should this method prove successful, and we have every reason to believe it will, an efficient swarf collecting installation will certainly pay for itself in a very short time, and will also serve to round out our full two-point program of conservation of diamond wheels and salvaging of the sludge and swarf produced by grinding carbide with diamond wheels.

Our program at Weldon will then not only be in keeping with the latest government regulation pertaining to diamond wheel usage, but it will also be in keeping with good, sound business sense pertaining to the saving of dollars and cents. By now, we all realize the value of diamond grinding wheels and the difficulty encountered today in replacing them when they are prematurely worn out or damaged through careless handling. As cost-conscious Americans and as defense-conscious Americans, it is very important for everyone to review their carbide grinding methods and make every effort to conserve and salvage whereever possible. I assure you all that when you have put into practice the recommendations as outlined in the current government regulations, and the few points that I have tried to put across to you, then you, too, will agree, as we at Weldon have, that the results are indeed well worth the effort.

We're Enthusiastic Over
Ease of Set-up and Accuracy of
DICKERMAN ROL-DI-FEEDS

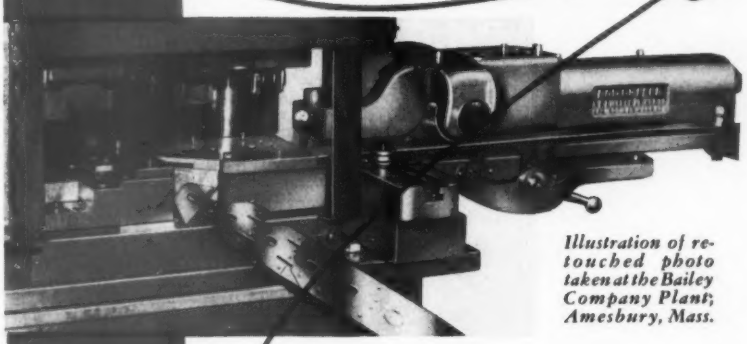


Illustration of retouched photo taken at the Bailey Company Plant, Amesbury, Mass.

As a result of their initial experience, when The Bailey Company, Amesbury, Mass., decided to equip the balance of their presses, Rol-Di-Feeds were selected.

States MR. H. W. POTTLE, *Chief Engineer*, "We are completely satisfied with the Dickerman Rol-Di-Feeds we have in service, as proven by our repeat orders. Our die setters who constantly use this equipment comment enthusiastically on its ease of set-up and accuracy."

Whether your operation is blanking, or producing parts from a compound or multi-station progressive die, the Rol-Di-Feed will do the job, reduce your costs and increase your production.

Write Dept. B for full information and a new photograph showing variety of work fed with this Rol-Di-Feed . . . . .

H. E. DICKERMAN MFG. CO.
323 Albany Street • Springfield, Mass.

Area vs Centralized Maintenance*

by H. A. Fohl
Mgr., Construction and Maintenance
Lukens Steel Company
Coatesville, Pa.

The big question today: is there a difference between Area Maintenance and Centralized Maintenance? If you want to boil this statement down into a clear concise, cold fact, Centralized Maintenance is Area Maintenance refined for economy and efficiency.

Today, Area Maintenance may be used by many companies, but let us look at present day trends and they all lead to only one conclusion—Centralization.

Just a few years ago, lubrication was a "catch can" process with the old squirt can, coffee pot and grease stick being used in many of our modern plants. What do we find today? We find that lubrication has become highly specialized; this specialization can be spelled only one way—Centralized Lubrication.

Today, lubrication is using laboratory tested lubricants for various applications, lubrication equipment is motor driven and is placed in clean lubrication houses with leads to all important parts of the equipment, operated by a well trained Lubrication Department, whose only function is to study and apply the best in lubricant and to the most effective places with very little loss of material. This means less maintenance costs to the equipment, and less manpower to handle.

Other items that a few years ago were scattered over areas, now centralized include equipment such as pumps, air compressors, main electrical drives.

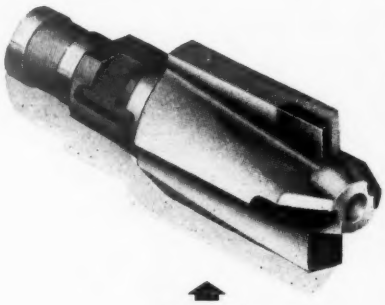
A few years ago, this equipment in its scattered areas had to have its own personnel to take care of it and operate.

Today, in a lot of cases they are centralized with only one idea in mind and that to achieve more economical and efficient operation. These moves give a low cost in the up-keep of equipment, small inventory of needed parts to keep the equipment in repair, less number of pieces of equipment and less man-hours in handling their operation.

If the equipment as described above can be centralized to a high efficiency and economy, why should it not be applied to maintenance itself? It has been proven that a centralized plan is conducive to less man-hours and higher type repairmen.

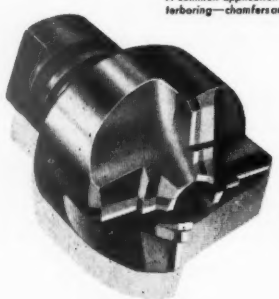
*An excerpt from a talk which Mr. Fohl gave at the 4th Plant Maintenance Conference. Mr. Fohl was Discussion Leader of a Round Table on "Area vs. Centralized Maintenance."

Take a Tip FROM US...

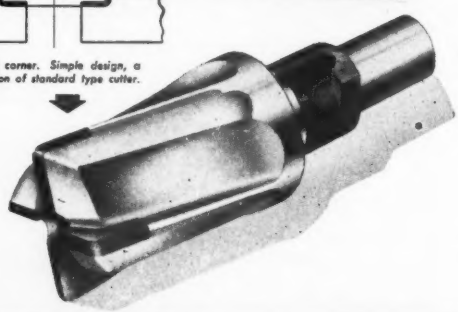


A common application in counterboring—chamfers and faces.

Just try the rugged Eclipse carbide tipped tools and you'll never settle for less. Thousands of them are in daily use in production machining of steel, iron, brass, aluminum and other materials cast and forged. Eclipse engineering experience is available at all times. Send your production problems to us today.



Radius corner. Simple design, a variation of standard type cutter.



Used in machining aluminum alloy. Finishes five surfaces.

ECLIPSE COUNTERBORE CO.
Founded in 1913
DETROIT 20, MICHIGAN

This also means that you no longer have a "specialist" that can only work or repair certain types of equipment due to the fact that he was located in one area and was familiar only with the equipment in that area; but the repairman under Centralized Maintenance is an "all-around" man capable of working on any type of equipment regardless of its location. You are able to secure a high type of employee because with less man-hours required for the work to be performed, you are able to pay more for the type workman you require.

Under the Centralized plan, you pay him for the work he turns out because he is working from a pool into which are fed many jobs and he does not have to sit around waiting for the job to come up. Often you can pull work-men from this pool to build new equipment which otherwise you would be required to purchase. You also pull this man out to work on either repairs made under normal conditions or on necessary emergency breakdowns. You are always confronted with enough man-power to perform any type of work under any emergency.

A few years ago, supervision was skeptical of a centralized plan, the supervisors and foremen were fearful that if an idea such as this were placed into operation, we would not have men available when an emergency arose. Today, in the plants where the centralized plan has been installed, these same supervisors and foreman are amazed to find that they have all the man-power needed.

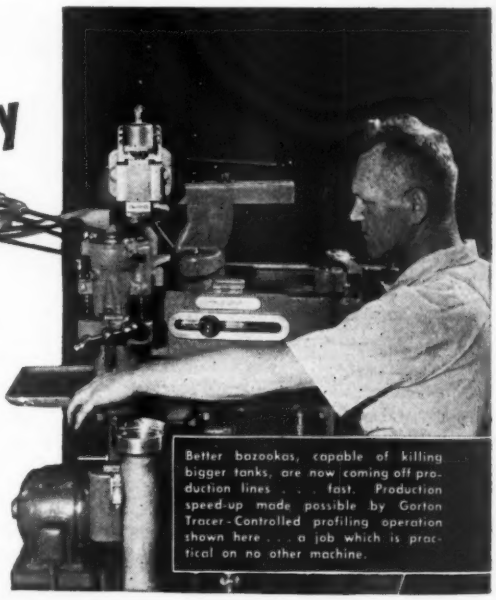
They find they are better able to do the jobs required of them, together with the building of some needed equipment which under the old set-up they could not accomplish. They find they have a more contented and cooperative personnel working under them and it is a known fact that if you give a work-man the proper tools to work with, the equipment to work on, and a place to perform the work, that you will get a 100% return on your investment in him.

The superintendent that had control under the area plan, which in many cases composed both production and maintenance, can under the centralized plan devote his time entirely to productivity fully realizing that he has no reason to worry over the equipment; fully realizing that his equipment is being handled by the right type of well-trained repairmen.

Pantography at Work

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

• IMPROVES QUALITY
• INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka
MATERIAL: Aluminum alloy
CUTTER: 5/32" dia. single flute, fast spiral H. S. steel running at 3,900 R.P.M., without coolant
MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually
HOLDING FIXTURE: Pneumatic-operated internal expanding type
APPROX. TIME: 36 pieces per hour
ALTERNATE METHODS: None practical

GEORGE GORTON MACHINE CO.

1202 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1202

Firm .....
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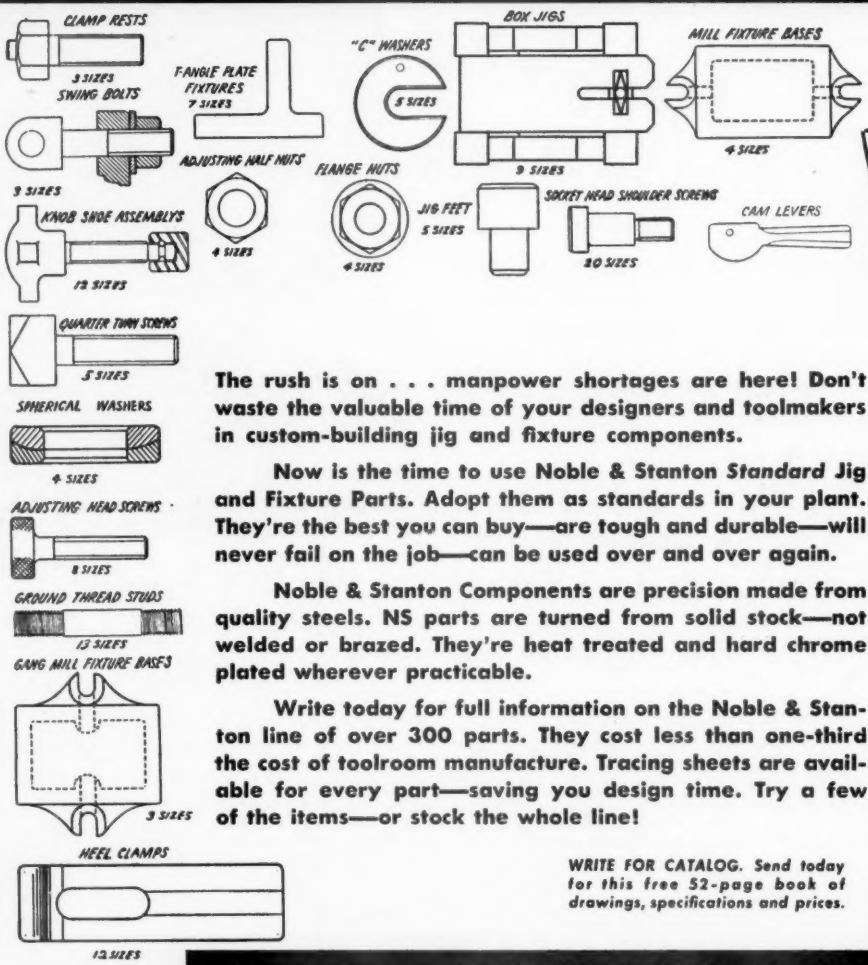
The Quality Line JIG and FIXTURE PARTS

SAVE MAN-HOURS

- Cut Designers Time
- Cut Toolroom Costs

OVER 300 COMPONENTS AVAILABLE AT ONE-THIRD THE COST OF CUSTOM-MAKING



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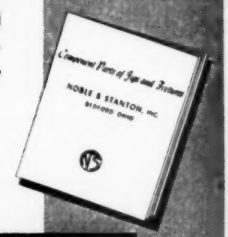

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5	20	59	78	94	109	124	135B	141A	146B	154A	159A	162E	166B	169B	176
6	22	61	79	95	110	125	136A	141B	146C	154B	159B	162F	166C	169C	177
7	23	63	80	96	111	126	136B	141C	146D	155A	159C	162G	166D	169D	178
8	24	64	81	97	112	129	136C	141D	148A	155B	159D	162H	166E	170A	
9	25	65	82	98	113	130A	136D	142A	148B	156A	160A	162J	166F	170B	
10	26	66	84	99	114	130B	136E	142B	149A	156B	160B	163A	167A	170C	
11	27	67	85	100	115	132A	137A	142C	149B	156C	160C	163B	167B	171A	
12	28	70	86	101	116	132B	137B	143A	150A	156D	160D	164A	167C	171B	
13	30	71	87	102	117	132C	137D	143B	150B	156E	161A	164B	168A	171C	
14	49	72	88	103	118	133A	137E	144	151A	157A	161B	164C	168B	172A	
15	51	73	89	104	119	133B	137F	145A	151B	157B	161C	164D	168C	172B	

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4	19	58	77	93	108	123	135A	140	146A	153B	158	162D	166A	169A	175
5	20	59	78	94	109	124	135B	141A	146B	154A	159A	162E	166B	169B	176
6	22	61	79	95	110	125	136A	141B	146C	154B	159B	162F	166C	169C	177
7	23	63	80	96	111	126	136B	141C	146D	155A	159C	162G	166D	169D	178
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A2	A11	A20	B2	B11	B20	B29	B38	B47	B56	B65	B74	B83	C5	E5
A3	A12	A21	B3	B12	B21	B30	B39	B48	B57	B66	B75	B84	C6	E6
A4	A13	A22	B4	B13	B22	B31	B40	B49	B58	B67	B76	B85	C7	E7
A5	A14	A23	B5	B14	B23	B32	B41	B50	B59	B68	B77	B86	C8	E8
A6	A15	A24	B6	B15	B24	B33	B42	B51	B60	B69	B78	B87	C9	E9
A7	A16	A25	B7	B16	B25	B34	B43	B52	B61	B70	B79	C1	E1	E10
A8	A17	A26	B8	B17	B26	B35	B44	B53	B62	B71	B80	C2	E2	E11
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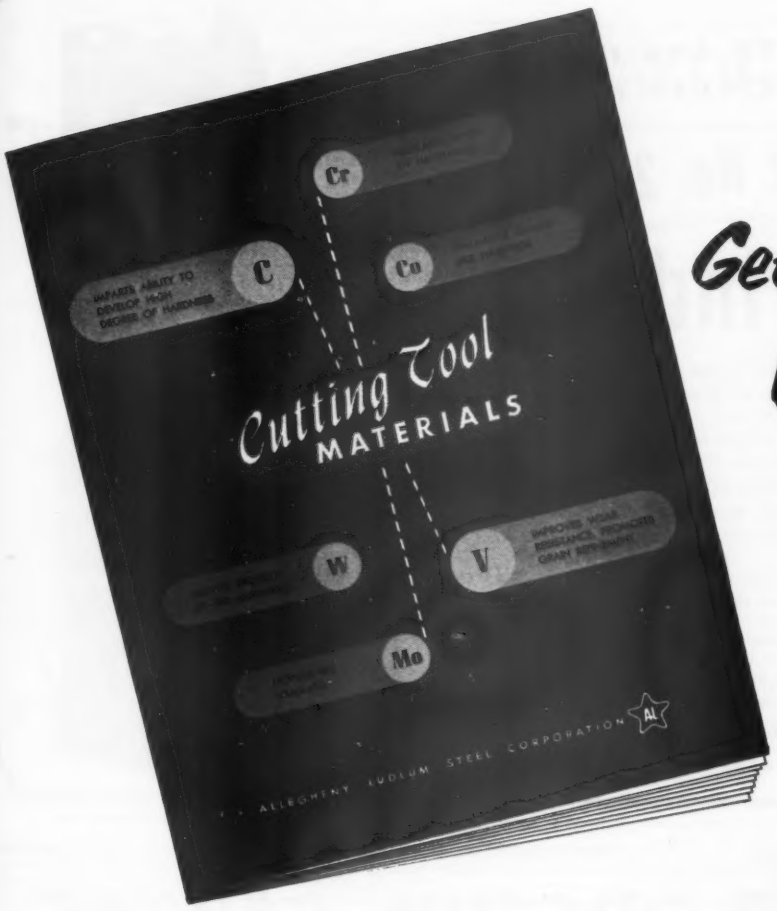

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This 'new-for-53' general catalog from the Cincinnati Milling Machine Co., has 52 generously illustrated pages comprising a comprehensive study of the complete company line.
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Imperial Brass industrial products are described in general catalog No. 3500, recently released. Tubing and tubing appliances and fitting equipment comprise the main subject.
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This instrument gives an immediate reading of surface roughness. Bulletin illustrated has valuable aid on use methods which can cut your inspection rejects and speed process.
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WHEELS
Bulletin gives data on specialized manufacturing methods assuring uniform accuracy of Simonds line of internal grinding wheels. Also all product data.
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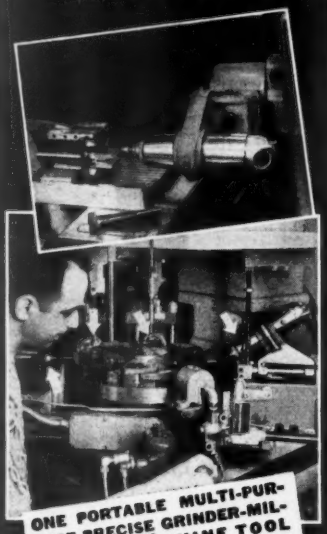

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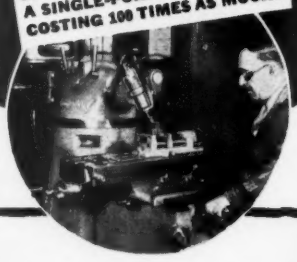

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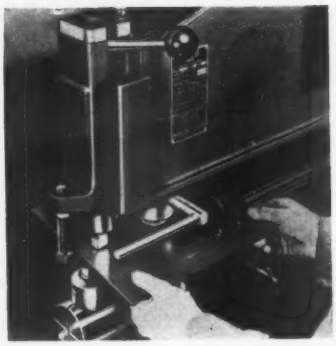

Photos courtesy Wales-Strippit Corporation.

Fig. 1. Showing a circle being cut of a flat sheet of metal. Note the special cam-action centering plate that assures perfect circles and arcs and fast change of work. In addition, this centering plate provides free and easy movement of the material.

Unique cam operation provides vibrationless operation. The material is not punched but is sheared to provide a smoothly cut edge.

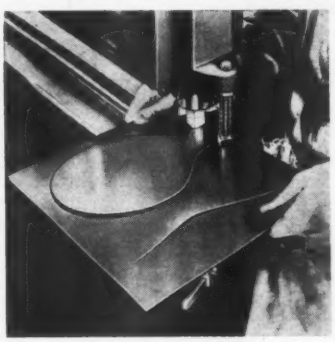

Fig. 2. Showing one of unlimited shapes that are easily and quickly cut by either following layout on sheet or with templates. Note unobstructed throat that permits free movement of the work. Special shearing action permits inside cutting without starting hole.

. . . Continued on page 137

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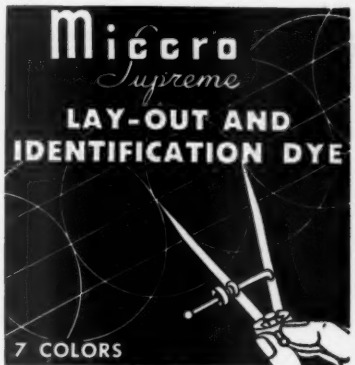

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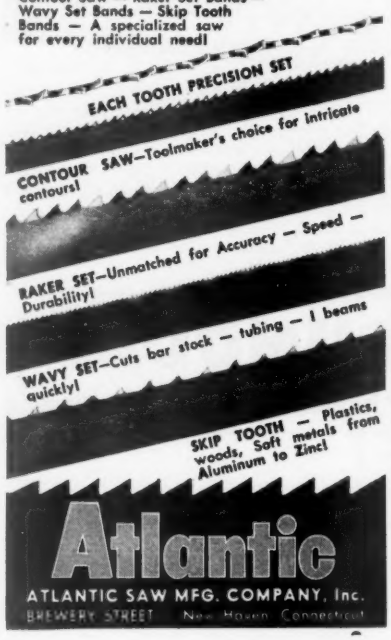
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Difficult Planing Jobs Speeded-Up with Carbide Tooling

Today's cost-conscious managements are achieving impressive production-time decreases up to 82.5 per cent on planing both steel and cast iron. This is being accomplished by use of standard clamp-on-tip planer tools for machining steel and heavy-duty Kendex cemented tungsten-carbide inserts for machining cast iron.

An outstanding example is noted in the planing of steel liner plates where Kendex grade K-1 was used to replace high-speed steel tools. On this job, offsets 9/16" deep by 1⅛" wide are planed on the sides of six, 32" long workpieces lined up end-to-end on the planer table. A fifty-year old planer having a top speed of 40 surface feet per minute with hand feed is used for the operation. Material is of 260-270 Brinell. Feed is approximately 3/32" with 9/16" depth of cut.

With the previously used tools operating 40 surface feet per minute at 1/64" feed, it required 40 minutes to plane the offset on one side of six liner plates. This same operation is now performed with carbide inserts in only 7 minutes.

Gives New Life to Old Machines

Since the old planer was not equipped with tool lifters, 14" hinges were clamped under the cemented tungsten-carbide tools to keep them from dragging on the return stroke. Results obtained demonstrate that tungsten carbide tools plus application make it possible to increase production even on an old machine.

Present day machine tools having greater rigidity, speed, and power permit more rapid and efficient metal removal with carbide tools. This was demonstrated by performing the above operation in about 2.3 minutes on a new Cincinnati Hypro Planer setup with Kendex-carbide tools operating at the same feed and depth of cut as before but with an increase to 120 surface feet per minute.

In another interesting instance, a machine tool builder, who previously had used high-speed steel tools for planing the top and side of 15-foot gray iron castings, now uses two heavy-duty Kendex inserts (1¼" diameter by ¾" thick) of cemented tungsten carbide grade K-1. Top surface of these pieces is 21" wide and the side, which is only 10" wide, presents severe interrupted cutting because of a series of openings along the entire length.

. . . *Continued on page 142*

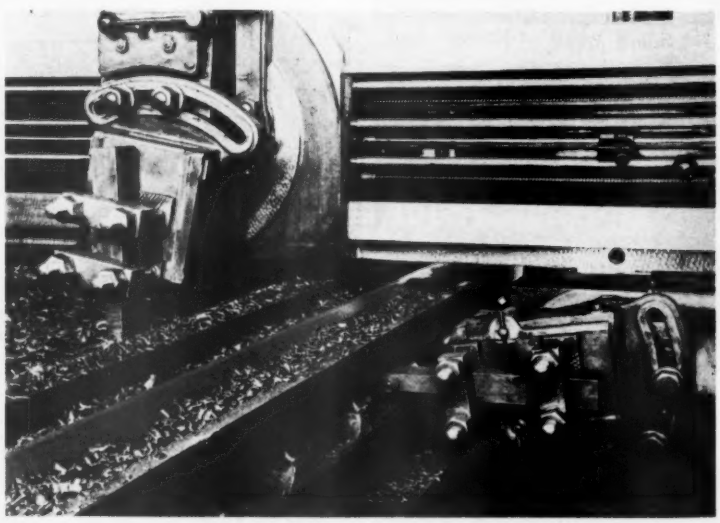

Fig. 1. Cast iron planing time reduced 50% with 1¼" diameter heavy duty Kendex inserts, grade K-1. Planing time with HSS was 86 minutes. Now with the indexable Kendex button type tool time is only 41 minutes. These inserts permit running at 150 SFM—three times faster than with HSS tool.

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Turret Diameter	4¾"	4¾"

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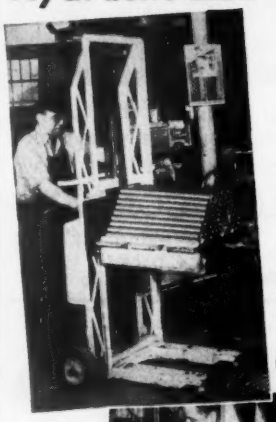

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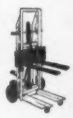

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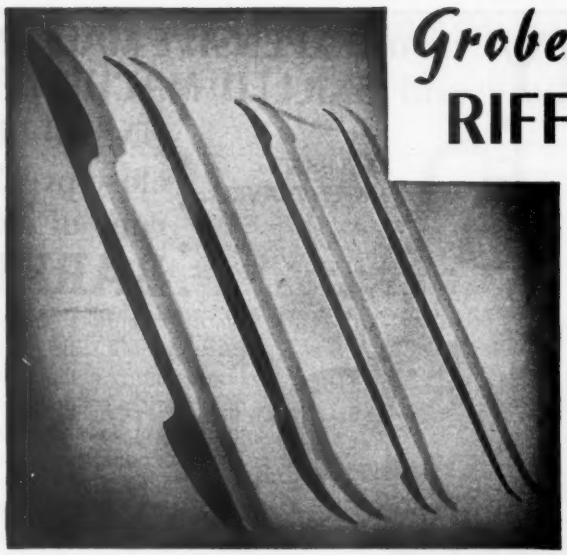

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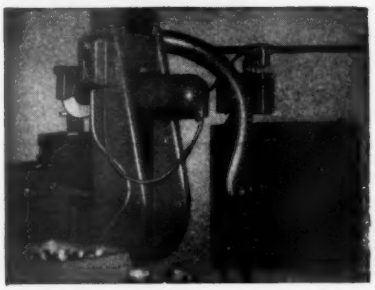

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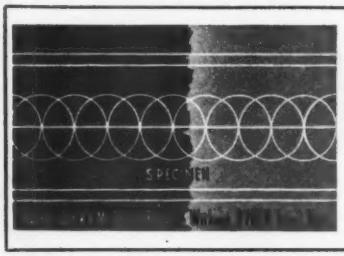

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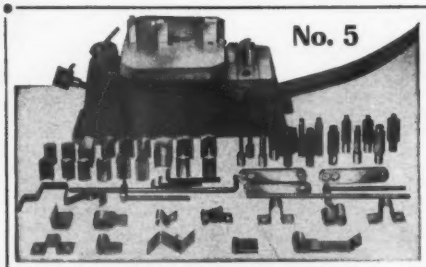

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. . . Contour Shearing, from page 132

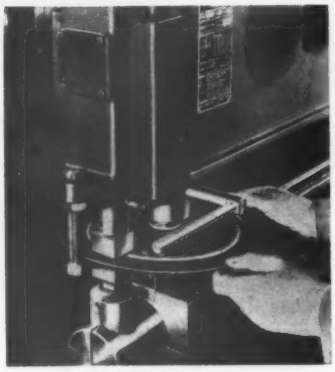

Fig. 3. Showing a circular bead formed in round sheet with simple economical tooling that is easy to change. Straight and curved beads may also be formed for strengthening light gage metals.

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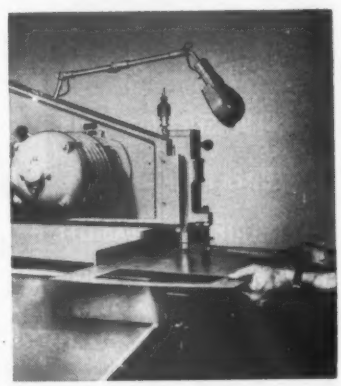

Fig. 4. Showing two rectangle panels sheared out of flat stock. Note the back edge of the work is sliding along the straight cutting guide. The rectangle in the foreground is completely sheared and the last edge is being cut in the rear rectangle.

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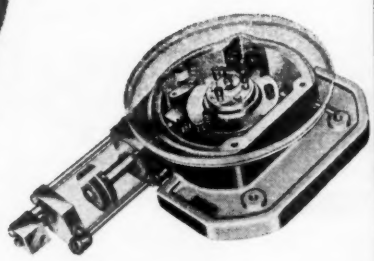

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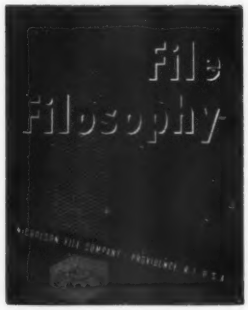
This Carboloy Manual is Valuable Aid in assisting designers and manufacturers in applying cemented carbide to the dies and punches for efficient and economical drawing, forming, piercing and blanking of sheet metal. Chapter subjects include carbide properties discussion; typical applications of all types dies and punches; designing, assembling and finishing of draw dies; designing and finishing of punches; and designing, finishing, and assembling of blanking dies. Carboloy Dept. of G. E. Co. **Circle No. C1.**

Case History Wise, this brochure from Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y., does an excellent job of explaining the wide possibilities of Moly-sulfide as a cost cutter in metalworking. Under operating conditions where ordinary lubricants fall down, it retains its full working efficiency and lubricity. **Circle Inform-A-Gram No. C2.**

Heat & Corrosion Resistant Alloy Castings in industry are described in this 48 pager from International Nickel, Dept. EZ, 67 Wall St., New York 5, N. Y. Typical compositions, with their applications, limitations and the types of service for which they are suitable are discussed. Over 175 photos illustrate applications. Charts compare creep strength, resistance to corrosion in certain media, and to oxidation at elevated temperature. Tables of composition list Alloy Casting Institute designations. **Circle Inform-A-Gram No. C3.**



"File Philosophy", now in the second printing of its seventeenth edition, is available to readers from Nicholson File Co., Providence, R. I. It has 48 amply illustrated pages, exhaustively discusses the various techniques of file manufacture and use. A selection from the chapter headings reads as follows: "How to get the most out of files; Special purpose files; The care of files." Different files and techniques for "Difficult" forms and alloys are individually treated. Of service to almost all of you. **Circle Inform-A-Gram No. C4.**

Deep Hole Drilling With Carbide is subject of new gun drill manual from National Twist Drill & Tool Co., Rochester, Mich. Detailed data includes sharpening instructions, typical machine arrangements for drilling, speeds, feeds, and power requirements. **Circle Inform-A-Gram No. C5.**

Reference Tables Booklet from A. Milne & Co., 745 Washington St., N. Y. 14, has 'Saveur' temperature conversion table, hardness conversion table, shop formulas for steel bar weight, decimal and millimeter equivalents, etc. Should be useful to tool engineers, metallurgists, and other executives as well as in shop. **Circle Inform-A-Gram No. C6.**

Easy-Vision Screw Calculator quickly gives all dimensions for standard screws. Threads per inch and proper tap drill size, plus body drill and counter-bore sizes are given for each diameter. In durable plastic, vest pocket size, from Standard Pressed Steel Co., Jenkintown, Pa. **Circle Inform-A-Gram No. C7.**

Data for Pluperfect Production Tapping. 24 pages of suggested tapping speeds, trouble check chart, thread elements and tap drill sizes, conversion tables, etc., in the Production Tapping Guide from Cleveland Tapping Machine Co., Canton 6, Ohio. **Circle Inform-A-Gram No. C8.**

"Do's and Don'ts" for maximum performance from air and hydraulic equipment are contained in booklet 'The Facts of Life' from Logansport Machine Co., Inc., Logansport, Ind. 18 pertinent pages give complete guide to best installation and servicing. **Circle Inform-A-Gram No. C9.**

"Weldability of Metals" is a 141 pager from Lincoln Electric Co., Cleveland 17, Ohio. Price 50¢, all the answers on procedures for both ferrous and non-ferrous metals.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Cemented Carbides, from page 62

Transverse rupture tests have been the conventional method of determining the strength of cemented compacts. Impact values would be a more accurate evaluation for most applications, but little work has been done along these lines. The sample used for the transverse tests is 0.230″ thick by 0.625″ wide by 0.750″ long, and is broken between a span of 9/16″.

Rockwell "A" hardness scale is usually used because of the danger of cracked impressions obtained with the larger load of the "C" scale reading. The diamond indenters also last much longer with the lighter load.

Cementation and shrinkage seems to take place more readily in coarse particulate systems than in fine ones, apparently because of the thicker cementing film. To obtain mechanically strong as-pressed compacts of the same composition and pressed density, but of different particle size, it is necessary to use more pressure to compact the powder possessing the larger particle size. The higher the pressure for any one particle size, the less the ultimate shrinkage and the lower the cementing temperature.

(To Be Continued)

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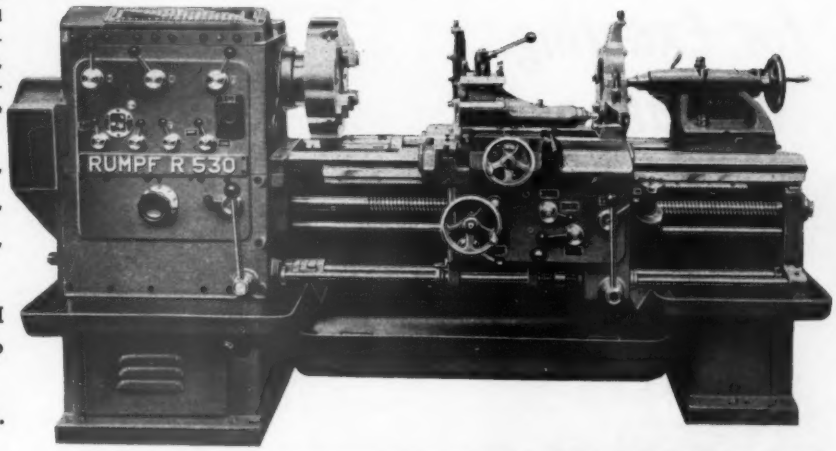

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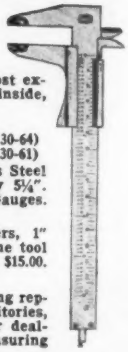

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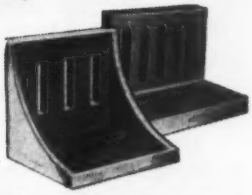

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Eclipse Angle Plates are available in "Webbed End" and "Open End" patterns. Made from high quality castings and seasoned before machining to prevent distortion. All faces of Open End and outside faces and edges of Webbed End patterns are machined square and parallel.

Webbed	Cost	Length	1st Angle	2nd Angle	Open End	Cost
#199	$2.50	3"	2½"	2"	....	....
#200	3.25	3½"	3"	2½"	....	....
#201	4.25	4½"	3½"	3"	#301	$5.50
#202	5.50	6"	5"	4½"	#302	7.75
#203	7.00	7"	5½"	4½"	#303	9.25
#204	9.00	8"	6"	5"	#304	11.50
#205	11.50	9"	7"	6"	#305	14.50
#206	17.00	10"	8"	8"	#306	18.50
#207	22.00	12"	9"	8"	#307	24.00

VICTOR MACHINERY EXCHANGE, INC.
DEALERS IN TOOL ROOM EQUIPMENT
251 P Centre St. • New York 13, N. Y. • Phone: CAnal 6 5575

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

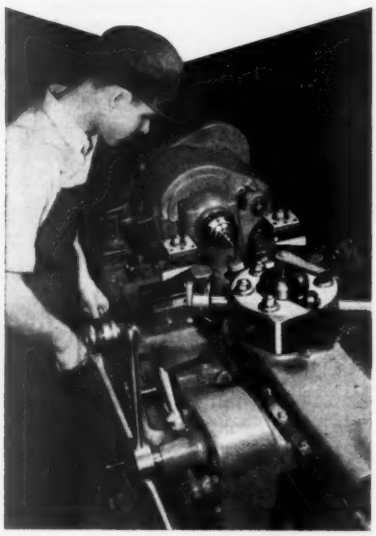
HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

HEIMANN MFG. CO. • URBANA, OHIO

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

SOUTH BEND
2-H TURRET LATHES
for Exacting Operations



Accurate . . . fast . . . easy to handle, South Bend 2-H Precision Turret Lathes are highly efficient on second operations where tolerances and finishes are critical. Exceptionally wide ranges of power cross feeds, power longitudinal feeds, thread cutting feeds and power turret feeds provide maximum output for diversified jobs. *Write for Catalog 67-F.*

SPECIFICATIONS:

Collet Capacity—1". Swing—16¼". Cross Slide Feeds—48, .0006 to .0315". Carriage Feeds—48 R. H. or L. H., .0015 to .0814". Thread Feeds—48 R.H. or L.H., 4 to 224 per in. Turret Feeds—96, .0001 to .0148".

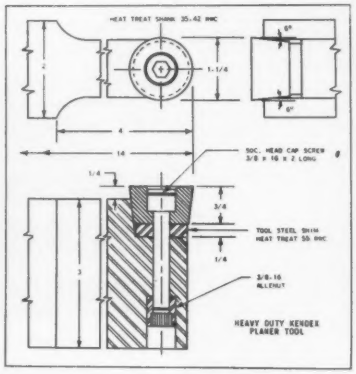
SOUTH BEND LATHE
SOUTH BEND 22, INDIANA

SOUTH BEND LATHES

. . . Carbide Tooling, from page 134

Production Time Cut Over 50%

Using high-speed tools at 3/32" feed, 50 surface feet per minute and a ⅜" to ⅝" depth of cut, planing time was 86 minutes. The operation is now performed in only 41 minutes using carbide inserts. These ingenious tools are used at the same feed and depth of cut as the previous tools but with the cutting rate increased to 150 surface feet per minute.



Photos courtesy Kennametal, Inc.

Fig. 2. Heavy duty planer tool designed for machining cast iron. The Kendex button insert size is 1¼" diameter x ¾" thick. Continuous 6° clearance permits feeding to right or left. Tool changing down time is greatly reduced by turning insert to new cutting edge.

On the sidehead, feed is reduced to 0.070" since there is no need to finish the 10" wide surface before the top is completed. Work is performed on a G. A. Gray planer of 56-inch x 56-inch x 30-foot stroke having mechanical tool lifters and a 75-horsepower variable voltage motor. Return stroke of the tool is 300 feet per minute.

These 1¼" diameter Kendex inserts used on this job are ideal for planing cuts up to ⅝" deep. It has a continuous 6° clearance which permits feeding to the right or left without tool changing. Downtime for tool changing is greatly reduced because the insert can be turned to a new cutting edge simply by loosening its socket-head cap screw. The number of new cutting edges available between grinds depends on depth of cut. Regrinding when necessary is a simple process since only the insert's top surface need be faced-off.

Over 85% of the torque wrenches used in industry are

STURTEVANT
TORQUE WRENCHES
Read by Sight, Sound or Feel.

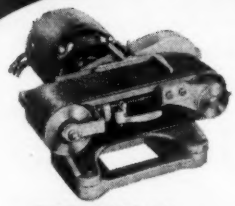
- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

STURTEVANT CO.

DOES IT BETTER
DOES IT FASTER



SIMPLEX-M
ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

Use KIPP AIR GRINDERS if you want to GRIND —not just rub!

MODEL JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

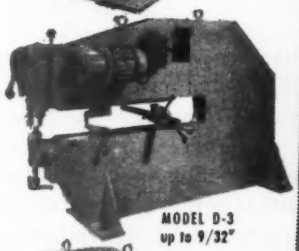
- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

PULLMAX
does all these operations

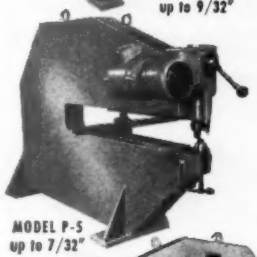
Save time, labor and expensive dies. Choice of 9 sizes and capacities to work from 16 ga. up to 11/32" thicknesses. Quick changing attachments. Works all steel and non-ferrous metal.

ALL OF THESE PULLMAX MACHINES . . .

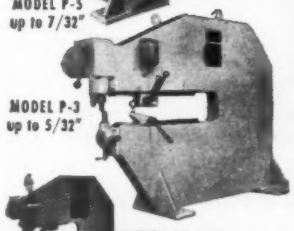
MAJOR up to 11/32"



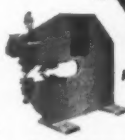
MODEL D-3 up to 9/32"



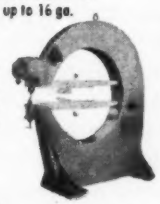
MODEL P-5 up to 7/32"



MODEL P-3 up to 5/32"

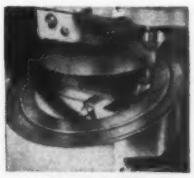


MODEL AM & AL up to 16 ga.



Pullmax Trimmer for trimming excess metal from bulky stampings up to 5/32".

DO ALL OF THESE OPERATIONS



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STRAIGHT CUTTING

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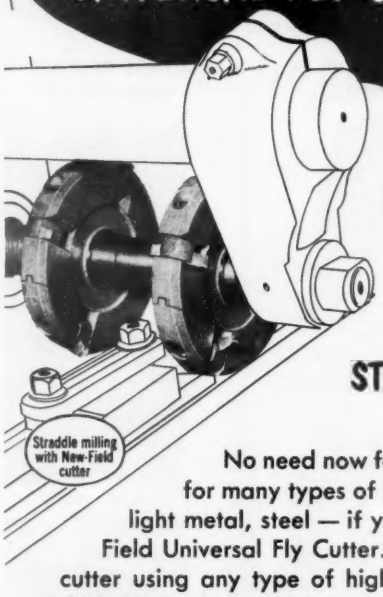
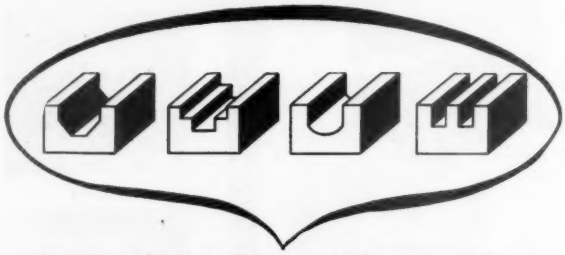
New-Field
UNIVERSAL FLY CUTTER



MAKES 4-6 CUTS IN ONE OPERATION!

USES STANDARD BITS!

No need now for special cutters for many types of milling—plastics, light metal, steel — if you use the New-Field Universal Fly Cutter. One New-Field cutter using any type of high speed steel or carbide bits makes multiple cuts in one operation. Standard bits are easily reground or replaced when needed for other work. Down time is cut to minimum.



These are only a few of the many different types of cuts possible with a New-Field Universal Fly Cutter.

New-Field Cutters fit all standard arbors on horizontal or vertical mills or drill presses, turn to any required speed, have adjustable bits to permit slots of any shape from 3/16" to 2" for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting. Available in 4", 6", 8" and 10" sizes, also 6" and 8" heavy duty size designed especially for Shell End Mill Arbors. Write today for details on this versatile, money-saving tool!

NEW-FIELD MACHINED PARTS CO.

210 W. 7th St., Los Angeles 14, Calif.
Export office: States Trading Co., 401 Broadway, N. Y. 15
Cable: STRADESO, New York

. . . Screw Machine, from page 48

bide within a series can usually be used with the result that longer tool life is realized, particularly on light cuts. Small, fragile tools also require stronger carbide grades. Negative rakes may avoid edge failure of the harder grades, but a more crater resistant grade will usually be required than with tools having a positive rake.

It should be remembered that the success in the use of carbides is also directly dependent upon the skill of the technician or tool man and also upon the type of equipment available for brazing these tips to a shank and for grinding. The accumulation of both experience and skill will serve in good stead when the carbides are employed.

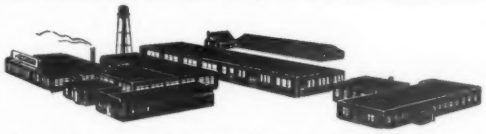
A few words can be said as to the use of both the carbon and the low alloy tool steels. The carbon tool steels having a nominal carbon of 1.05 percent have been employed as reamers, twist drills, taps and dies. In the use of this material, the tool maker should be interested in such factors as (a) the toughness of the steel; (b) its ability to harden uniformly and without soft spots; (c) the distortion likely to take place in hardening; (d) the freedom from sponginess and non-metallic inclusions; and, (e) the susceptibility to cracking upon hardening. In regard to hardening depth, this value may be from 5/64 to 14/64 inches on a one inch round specimen; this variation usually resulting from both grain size and melting technique.

The vanadium content of a carbon-vanadium tool steel is usually placed at a nominal value of 0.20 percent; this element producing and retaining a fine grain over a wide range. This is associated with an increase in toughness of the quenched or quenched and tempered section. When vanadium is associated with chromium as exemplified in the chrome-vanadium alloys containing approximately 0.80 percent chromium and 0.20 percent vanadium, a wide hardening range is permissible without harmful results as to either grain size or toughness. The addition of the chromium will also result in a one inch round hardening quite uniformly from surface to center. Thus, an increase in alloy content has a tendency to decrease the difference in hardness between the surface and the core. In both these types of alloy material, a carbon content of approximately 0.80 percent with the alloys above provides a composition which is used for small taper reamers, reamer bodies and chaser bodies. Upon increasing the carbon

Continued on page 160

UNIVERSAL DRILL BUSHINGS establish new standards of high quality

Universal Drill Bushings, produced at the big, modern plant of the Universal Engineering Company, have been first in industry for more than 25 years. They are accurately machined with superhoned bores from the finest quality steel and carefully inspected to insure maximum efficiency and extremely long life. Write today for complete information.



The modern home of finer production tools

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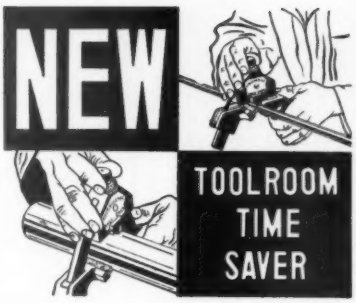
NEW TOOLROOM TIME SAVER



SIMPLE TO SET UP AND OPERATE ★ LIGHT WEIGHT ★ VERSATILE ★ ACCURATE ★ INEXPENSIVE

Odee-Hone *A Tool for Honing External Surfaces*

One tool for any cylindrical surface from ½" to 2½" in diameter—any length • Removes Stock • Holds accurate size • Generates—round, straight surfaces • Develops any degree of surface finish—without chatter.

USE WITH ANY LATHE, DRILL PRESS OR ELECTRIC DRILL

Manufactured by
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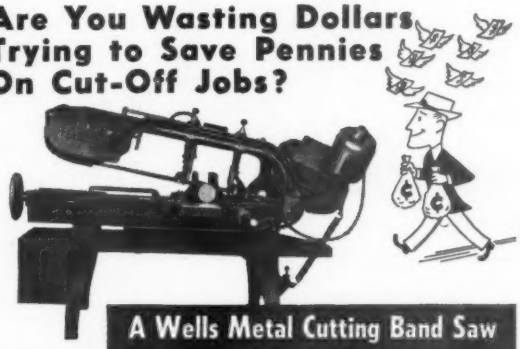
Are You Wasting Dollars Trying to Save Pennies On Cut-Off Jobs?



Wells No. 8 with wet cutting system.

A Wells Metal Cutting Band Saw pays for itself in savings

IT'S easy to fool yourself about costs on your cut-off jobs. Perhaps you say, "It doesn't amount to much, why worry about how we do it." You'd be surprised. Look at what a Wells Saw gives you—Modest first cost with a model for every budget . . . Rugged, heavy duty construction for minimum cost per year . . . Fast, continuous band saw cutting . . . Accurate cutting to minimize subsequent machining . . . Simple operation that requires no special skill.

To cut your cut-off costs, ask your Wells Distributor for further information or write direct.

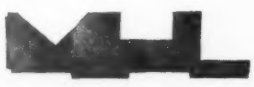
Standard Wells Saws: No. 49A—3½" x 6½"; No. 5—5" x 10"; No. 8—8" x 16"; No. 12—12" x 16". Wet cutting systems available for Nos. 5, 8 and 12. Automatic bar feed available for Nos. 8 and 12. Special machines for capacities to 48" x 48".

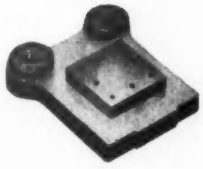
Wells Saws
Wells

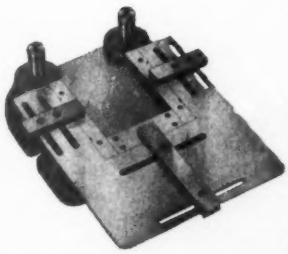
Products by Wells are Precised
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
1949 CEDAR ST., THREE RIVERS, MICH.

Punches and Dies

Notching Die with Gauge Table







Standard stock sizes 4", 5" and 6". Lick those *Notching Problems* QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

—or what have you?

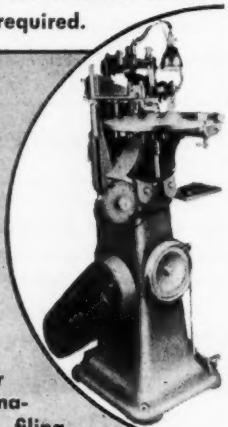
What are your punch and die needs? Consult us about those problems. *Satisfaction is your reward when you Re-WARD your orders.*

Send for free illustrated catalog No. 152 AA. Net prices shown.

WARD Machinery Co. 564 West Washington Chicago 6

Toolroom Efficiency Increased . . . Precision Assured With OLIVER DIE MAKING MACHINES

Speedy and Accurate They Effect Savings in Time and Costs Up to 60% . . . yet they're so simple to operate skilled labor is not required.



The Oliver Method for machine sawing, filing and lapping operations has proved itself for more than 40 years in thousands of plants throughout the world. Built to give long-lasting, efficient service, many Oliver Die Making machines have been in continuous use for more than 25 years.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

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MACHINE TOOLS by OLIVER include: AUTOMATIC DRILL GRINDERS, TOOL & CUTTER GRINDERS, DRILL POINT THINNERS, TEMPLATE TOOL GRINDERS, FACE MILL GRINDERS, DIE MAKING MACHINES

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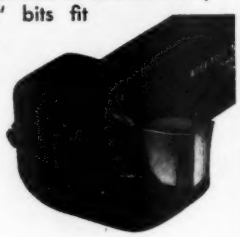
APEX TOOLS *AVAILABLE PROMPTLY*

INSERTED-BLADE METAL CUTTERS FOR EVERY NEED

The famous "Apex" Shankless, Adjustable, Serrated design offers you holders for every metal removing job. Forty tool bits to choose from, all interchangeable without regrinds. "Apex" bits fit holders of other make. Check with us on this. Carbide tips if desired. Send for catalog.

"Apex" inserted-blade milling cutters incorporate the adjustability and economy necessary in these tense times when every ounce of material and every minute of time are vital.



APEX TOOL & CUTTER CO., INC.
SHELTON 17 CONNECTICUT

While they last!...

New END MILLS

(NATIONALLY ADVERTISED BRAND)

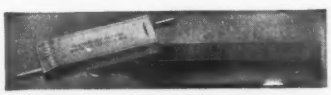
1 5/8" dia.—HSS—8 flute, fast spiral, 1/8" bevel on end, #9 Brown & Sharpe taper shank tapped for draw rod.

$6.00 Each POSTPAID — 12 For $66.00 POSTPAID

HAYNES TOOL COMPANY
1617 VESTAL ROAD — VESTAL, NEW YORK

THE KOCH TEST INDICATOR

IS THE ONLY TOOL MAKERS INDICATOR ON THE MARKET WITH TWO WORKING ENDS, FOR PRECISION WORK, ONE END TO TEST OUTSIDE SURFACES, THE OTHER INSIDE.



Plunger moves away from, instead of against the lever, protecting delicate parts from sudden or excessive jolts. Each graduation on scale represents 1/1000" movement of plunger. $7.50 plus postage.

Positive-Lock SURFACE GAGE

Drawbolt has positive lock to prevent slippage. Spindle: 9"x5/16". Block: 3¼"x2½"x1" with 90° angle groove in base. Surface Gage is precision ground. $8.75 plus postage.

Ask your dealer for these tools and buy through him. If he can not furnish them, write to us.

ANDREW GENALES, NYACK, N.Y.
A-28 Second Ave. Tel. Nyack 7-2222

WHAT EVERY TOOL ROOM TOOL MAKER OR MACHINIST NEEDS.

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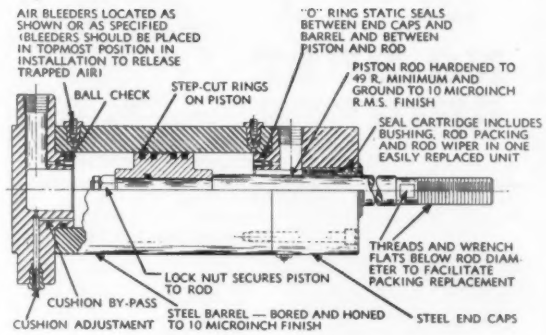
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS — Mail FREE Inform-A-Gram Card for MORE Details.

All-Steel Bodies, Bored Barrels, hardened piston rods, rod scrapers and new cartridge type packings assure long life under abrasive conditions for these new cylinders by Hydro-Line Mfg. Co., 748 19th St., Rockford, Ill. Cushions are optional as shown in the cut-away view illustrating construction details. The score-resistant, hardened piston rod and improved gland packing protected by scrapers make this series "J" cylinder especially useful in foundries and mills processing ceramics, rubber, and steel. Fabricated steel end caps and heavy wall steel tubing combine to make the cylinder body unusually damage resistant. Barrels are bored before honing to insure precision piston ring fit for full stroke length. Regularly available for oil or water service in bore sizes up to 10" diameter. **Circle No. A1.**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BALL CHECK
STEP-CUT RINGS ON PISTON
"O" RING STATIC SEALS BETWEEN END CAPS AND BARREL AND BETWEEN PISTON AND ROD
PISTON ROD HARDENED TO 40 R. MINIMUM AND GROUND TO 10 MICROINCH R.M.S. FINISH
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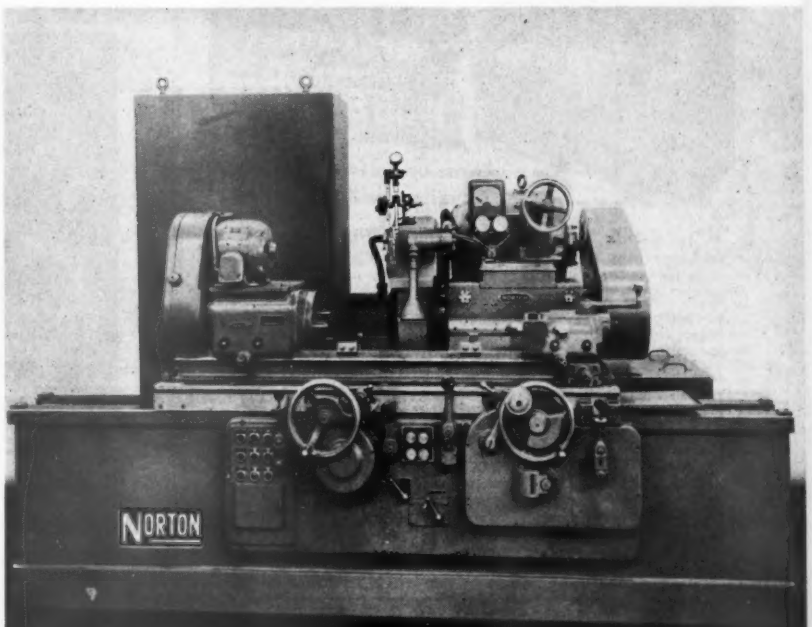
CUSHION BY-PASS
CUSHION ADJUSTMENT
STEEL BARREL — BORED AND HONED TO 10 MICROINCH FINISH
STEEL END CAPS

Designed for Mounting Small Precision Work, this new rotary table by South Bend Lathe, South Bend 22, Ind., can be used on a drill press, milling machine, shaper, or surface grinder. Accurately spacing drilled holes, indexing clutch teeth, milling circular grooves or T-slots, machining square or hexagon shapes—these

are just a few of the many operations that can be performed. Precision ground work table has 3 T-slots, and measures 4½" in diameter. It is rotated by worm gearing having a graduated collar and ball crank. Each graduation indicates a table movement of 3 minutes and one complete revolution of the ball crank turns the table 5 degrees. A small knurled thumbscrew permits easy resetting of the graduated collar to zero. Table is graduated 360°, with handy lever clamp locking in any position.
Circle Inform-A-Gram No. A2.

New by Norton. 10" type CTU-HD and 14"" type LCTU-HD cylindrical grinders are being made by Norton in 18", 36", 48", or 72" inch work lengths, and rapidly and accurately perform plunge-cut and traverse grinding operations requiring larger wheels than can be accommodated by the conventional type CTU's. The most important feature of the new range is the heavy wheel head with pressure lubricated spindle for wheels up to 10" wide. The extremely high service capacity of this head, combined with rigid work-supporting units and smoothly operating sliding components, assures fast grinding action with enduring precision. Wheel feed is by an outstandingly precise "revolving feed screw" type mechanism having a "click-count" index by which settings for .0001" work diameter reduction are made instantly and without visual attention. Setup and operation are simplified by accessible placement on the front of the machine of all adjustments for feeds and speeds. Speeds are preset and preselected. Some of the other features include automatic control of work rotation and coolant flow, automatic adjustable wheel feed at table reversals, while all pumps and motors are outside mounted to simplify maintenance. By the Norton Co., Worcester 6, Massachusetts. **Circle Inform-A-Gram No. A3.**



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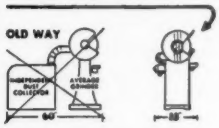

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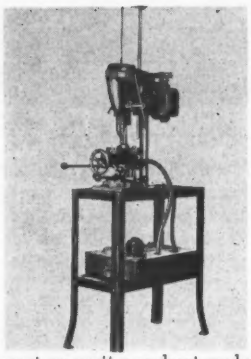
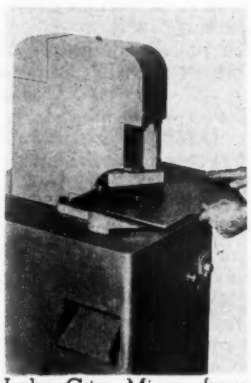
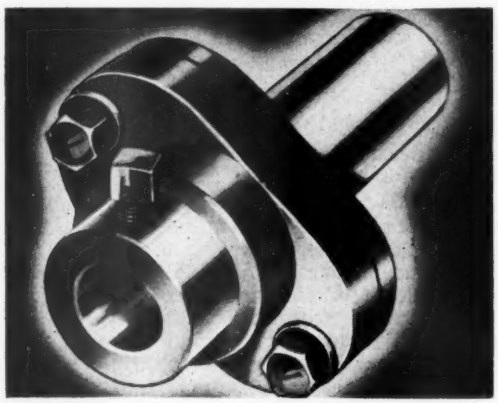


New Complete Turnomat has capacity up to 1¾" bar stock, with four interchangeable heads that permit change in minutes from 1/32" to 1¾" capacity. Turnomat machines and attachments are famous for their ability to turn to small diameters in one plunge cut and to almost unlimited lengths; to taper, form, knurl, thread, drill and ream. Operations possible with Turnomat permit product redesigning for sizeable savings in time and money. From the Turnomat Co., Dept. 15, Brockport, N. Y. **Circle Inform-A-Gram No. A4.**



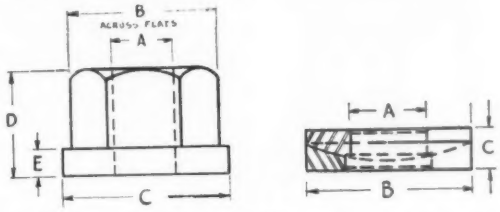
This New Machine Will Save a large part of the cost of expensive dies and heavy presses in notching sheet material. A notch as large as 6" x 6" can be made in 16 gauge sheet steel, and notches both larger and smaller than 90°, as well as some straight shearing jobs, can be performed by making a few simple adjustments. Rate of operation may be as high as 180 strokes per minute. By O-Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn., from whom all further data and specifications may readily be obtained. **Circle Inform-A-Gram No. A5.**

Latest Screw Machine Tool manufactured by Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., is this releasing type tap holder which provides correct alignment between turret and spindle. It is available in five sizes to fit all hand screw machine turret lathes. Bodies and heads are forged to guaran-



tee the utmost strength and durability, and the tool is very easily changed for right or left hand tapping. A releasing mechanism which permits accurate control of tapping depth is enclosed for maximum protection of moving parts. Actual field tests in daily use have proved the new tap holder to be an outstanding tool in its field. **Circle No. A6.**

New Products Have Been Added to the line of tool components made by Reid Tool Supply Co., 709 Baker St., Muskegon Heights, Mich. These are two piece spherical washers and collar or flange nuts. The washers are made in high quality low carbon steel precision machined and case hardened. All sharp edges are removed and they are zinc plated for rust prevention and appearance. 8 sizes, for use



with bolts from ¼" to 1" dia. The collar or flange nuts are also made in case hardened low carbon steel. Special care is taken in the production of a flat contact surface. Again the product is zinc plated, and 9 sizes for bolts from ¼" to 1" dia. are available. **Circle Inform-A-Gram No. A7.**

.0002" Maximum Point Runout is boasted by these new heavy type live centers developed by Holub Industries, Inc., Sycamore, Ill. Having a maximum rating of 6400 lb. at 100 rpm, or 3200 lb. thrust load, they afford important cost reductions when turning heavy work or taking exceptionally coarse cuts. Matched precision taper roller bearings are designed and selected to absorb unusual shock loads and abuse. Very short overhang, preloaded bearings and heavy grease seal are other features. **Circle No. A8.**

New Improved Cold Type Degreaser. Agitene, by the Graymills Corp., 3713 N. Lincoln Ave., Chicago 13, Ill., now contains "Tergene," a valuable detergent compound, for faster cleaning action. It is used in various types of parts cleaning equipment and for "cold" dip tanks. The product is listed by the Underwriters' Laboratories, having a flash point of 110°. It is non-toxic; will not harm any metal; and

does not require a water rinse. It is used for removing cutting oils, lubricants, grease, and sludge, and it has a mild, pleasant odor. For ready identification it is of a light blue color. It is available in 5, 30, and 55 gallon drums. Full data is now to be had from the manufacturer. **Circle Inform-A-Gram No. A9.**

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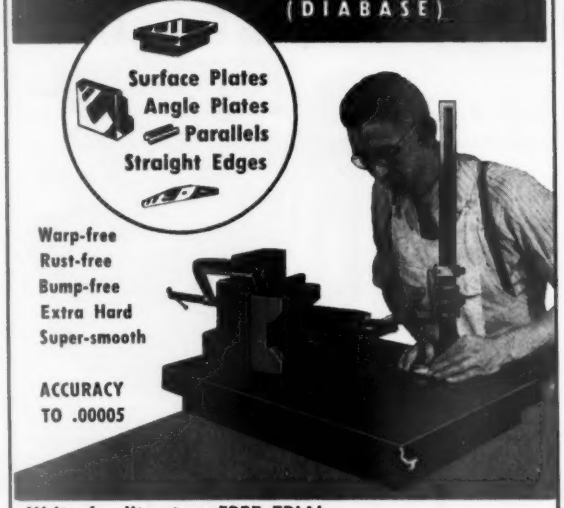

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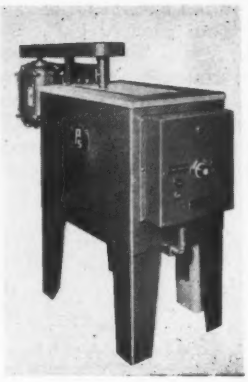
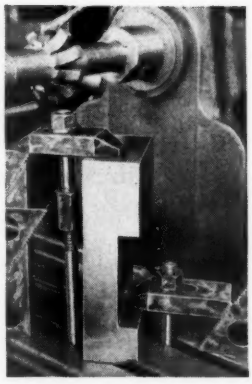
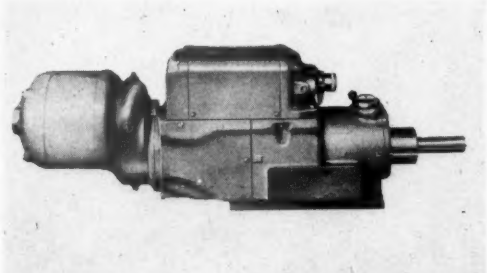


New Design Reduces Melting Time from 6 to 8 hours to less than 2 hours on a 44 lb. capacity tank in these production dipping tanks for plastic seal hot dip protective coatings. There are five standard models in a complete size range, now available from Globe Imperial Corp., 2023 Kishwaukee St., Rockford, Ill. Many highly desirable engineering features are built in.
Circle No. A10.



Strap Clamps Have Just Been Added to the line of setup tools of North western Tool & Engineering Co. ,116 Hollier Ave., Dayton 3, Ohio. These clamps are designed for rigid clamping, beveled on the nose for cutter clearance, and furnished in plain and step types. They are available in lengths of 2½", 4", and 6" to handle from ⅜" to ¾" diameter studs.
Circle No. A11.

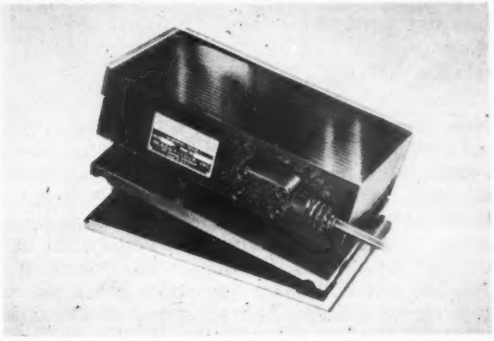
Tailor-Made for High Production. this model 19600 air powered hydraulic drill unit has just been introduced by Delta Power Tool Div. Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. The unit is designed for heavy-duty drilling, tapping, reaming, spot-facing, hollow milling and similar operations, and features quick set-up, versatile hydraulic feed control, fast traverse to positive stops, simple compact design and universal mounting. The unit has a maximum stroke of 6" and 1800 lb. thrust with 80 psi air pressure. It can use up to a 5 HP motor



and a 1⅛" drill. Standard spindle used contains a No. 4 Morse internal taper. Length of stroke control is by means of a positive micrometer stop that is infinitely adjustable from 0 to 6". Depth can be held to within .0005". Rapid approach is at a maximum rate of 5" per second with infinite length adjustment to full stroke. Rapid return has a maximum rate of 4" per second. Locking devices permit using the feed adjustment on the return strike for spot facing, etc. **Circle Inform-A-Gram No. A12.**

Especially Suitable for Grinding Carbide, #44A new precision tool grinder by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich., is smooth and true running, and will sharpen all sizes of boring, turning, and facing tools up to ⅝" square. Features include heavy steel base with ample height for operator convenience, large U-shaped tool rest tables rigidly supported, and hardened steel wear plates. Table adjustment is shown on a scale graduated in degrees, and a large coolant tank is located in the base. Also reversible motor. **Circle Inform-A-Gram No. A13.**

Specially Designed to Permit Precision angular setups on surface grinders in minutes instead of hours, this new Magna-Lock sine chuck also provides the advantages of magnetic mounting. In addition, it is simple to use. There are no dials or gauges to interpret. Standard gage blocks assure maximum accuracy. The gage blocks required for



a particular single angle or compound angle set-up are quickly determined by reference to the table of constants furnished with each chuck. The powerful magnetic attraction of the sine chuck holds work securely during the grinding operation, eliminating distortion or warpage of the workpiece. Magna-Lock, Inc., Dept., 1650 Big Rapids, Mich.
Circle Inform-A-Gram No. A14.

New Universal Tool and Cutter Grinder, known as the Sterling model "G", has just been introduced by the McDonough Mfg. Co., Eau Claire, Wis. This machine is completely new from the cast base, which is designed to dampen vibration, to the direct drive wheel head which uses Excello spindles. The wheel head rotates a full 360° and the work table swivels a full 180°. The swing over the table is 10¾" and the maximum distance between centers with LH and RH tailstock is 27". The machine is available in both plain and universal styles, and specially located controls make it possible to operate the grinder from front, left, or right hand sides. **Circle No. A15.**

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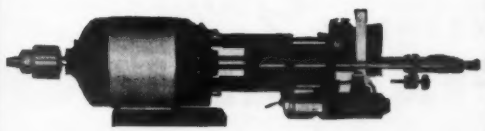

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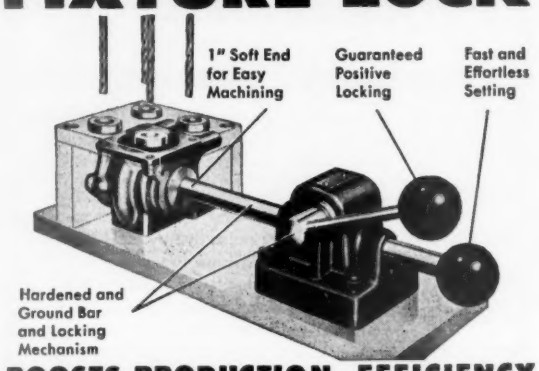
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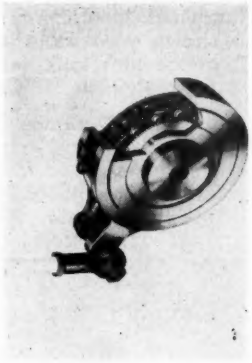
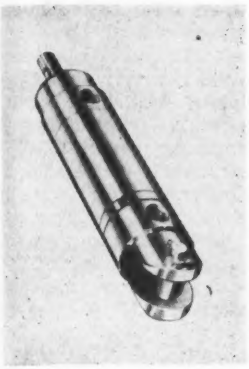
"Thinsaws" with Contour Forms are now being supplied by the Gay-Lee Co., Clawson, Mich. This enables users to employ carbide with its longer life and higher speeds. Convex forms, including radius and radius with angles tangent and their variations, in diameters to 8" and in thickness from .030" up. **Circle No. A16.**



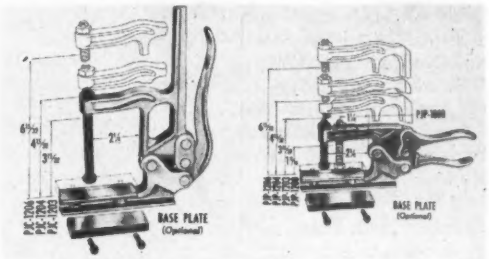
6,720 Graduations Are Possible with this "Select-O-Matic" indexer by Durant Tool Supply Co., 155 Orange St., Providence 3, R. I. When attached to a roll feed with 2" dia. rolls will index the roll feed within .006". This unit has the accuracy of all ratchet type feeds, but because of the multpile combination it has the flexibility of a friction type. **Circle No. A17.**

New Tractor is Designed as a "Walkie" Type or can be ridden by the operator. Combination enables the operator to walk the tractor and load on short hauls and ride when the run is longer. Tractor is manufactured with either a 12 volt or an 18 volt battery. Overall dimension of 12 volt tractor is 27" wide, 48" long. Has 2 speeds with maximum 3½ mph. The 18 volt tractor measures 31" x 48" with two walking speeds. A third speed of 4½ mph is provided for when the operator is riding. The operating handle automatically goes to an upright position when released, and automatically sets the brake and cuts the motor. Short wheel base enables minimum turning radius. Cushion rubber tires afford smooth riding quality and lessen operator fatigue. The operator can enter from either side, and he is protected by guide rails from both front and rear. Complete data may be had from the manufacturer, the Moto-Truc Company, 1990 East 59th St., Cleveland 3, Ohio. **Circle No. A18.**



Elimination of Tie Rods and reduced head size are the most attractive design feature of the new line of "Spacemaker" air cylinders. Savings of up to 40% in mounting space are achieved. Added strength and an extra high safety factor are given by solid steel heads and heavy wall seamless steel body. Walls are precision honed and hard chrome plated. Tomkins-Johnson Co., Jackson, Mich. **Circle No. A19.**

Eight New Toggle Clamp Models are announced by Lapeer Mfg. Co., Lapeer, Mich. As shown in the illustrations, they are of the plier type, with five of them having horizontal handles and three a vertical handle. They were developed to provide a new type



of equipment to tool rooms demanding individual clamps having greater thickness capacity. The PJP series represents a clamping range from 1 11/16" to 6-15/32" with throat capacities of 1¼" to 2¼", and the PJC series range from 3-15/32" to 6-15/32" with throat capacities of 2¼". **Circle No. A20.**

Produce Extremely Flat and Square Surfaces inexpensively, by hand, and without fixtures or skilled labor with this new Bridge Surface Grinder. A 5" cup wheel protrudes slightly through a stationary fence along which the work is moved. As the center section of the fence is on the same plane as the outer sections, a flat surface is automatically generated. Grinding wheel protrusion through the

fence is controlled through the front hand wheel. A diamond dresser and miter gage are furnished as standard equipment, while provision is made for the fitting of an indicator gage as an extra accessory. Southwest Machine Works, Albuquerque, N. M. **Circle Inform-A-Gram No.A21.**

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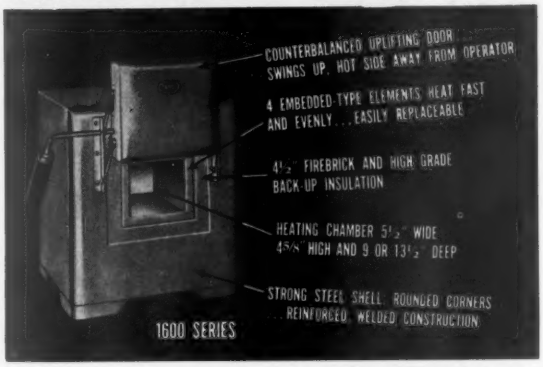
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STRONG STEEL SHELL ROUNDED CORNERS ...REINFORCED, WELDED CONSTRUCTION
1600 SERIES

Step up production, cut costs with Temco electric furnaces for heat treating dies, parts, tools, etc. Model illustrated above one of eight convenient sizes available with either electronic or manual temperature controls. Economical, easy to install and operate, low cost. Priced from $55.00 to $507.50. Write for literature and nearest dealer's name.

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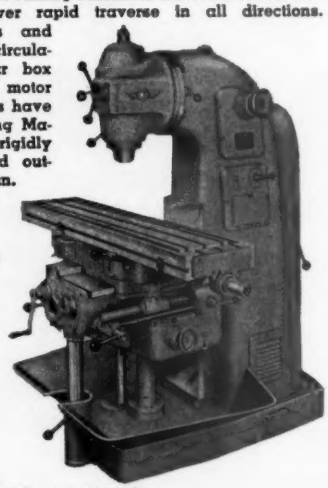
HERCULES #2 PLAIN, UNIVERSAL & VERTICAL MILLERS

PRECISION MILLING MACHINES
For Toolroom and Production Work

These HERCULES #2 Milling Machines have hardened and ground gears, power rapid traverse in all directions. 12 spindle speeds and feeds, separate oil circulation for main gear box and feed gearbox, motor in the base, spindles have #50 Standard Milling Machine Taper. Knee rigidly supported by round outboard sliding column.



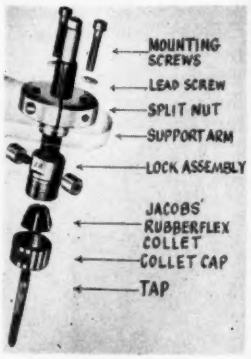
Worktable overall 12" x 51"
Automatic long feed 32 in.
Spindle speeds 40-900 RPM
Main Motor 5 HP
Feed Motor 1 HP
IMMEDIATE DELIVERY

Full Details will be sent upon request

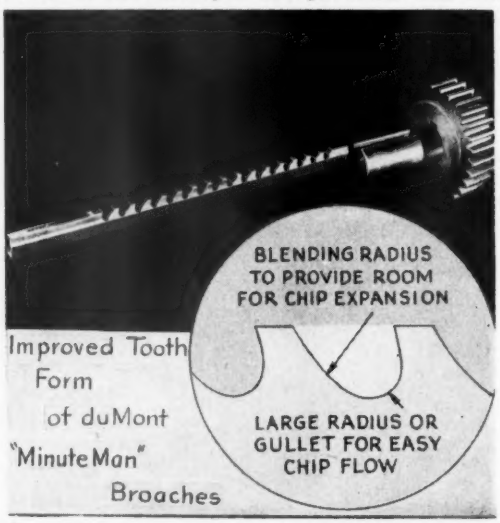
PARKER MACHINE COMPANY, INC.
158 PIONEER STREET • BROOKLYN 31, N. Y.
TEL. TRiangle 5-2103 & 2157

New Stub Drill Chuck, Improved Drill Life. For use in the multiple spindle heads made by the Continental Tool Works, Div., Ex-Cell-O-Corp., 1200 Oakman Blvd., Detroit 32, this new chuck cuts costs in drilling through bolt or clearance holes. The setup is sufficiently rigid to altogether eliminate the use of bushings and bushing plates. Full data in bulletin 60224.
Circle No. A22.

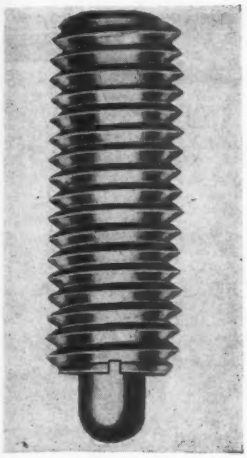
"Fool-Proof" Thread Tapping is given by this lead screw tapping attachment by Automatic Methods, Inc., Room 282, 42 Walnut St., Newark, N. J. Variety of split nuts and matching lead screws available in different pitches to suit a wide range of tapping requirements control the tap drive. Illustration shows construction features.
Circle No. A23.



A New Tooth Form in all of its "Minute Man" keyway broaches has just been announced by the du Mont Corp., Greenfield, Mass. The new form, as illustrated, gives greater room for chips, assures better curling of the chips and prevents clogging or wadding. This new form departs from orthodox practice in not having a straight flank and small

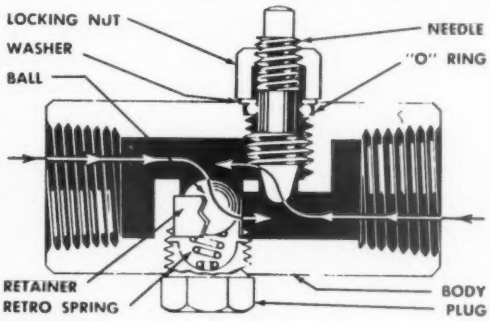

BLENDING RADIUS TO PROVIDE ROOM FOR CHIP EXPANSION
Improved Tooth Form of duMont "Minute Man" Broaches
LARGE RADIUS OR GULLET FOR EASY CHIP FLOW

radius. This form tended to corrugate the chip, and often led to poor finish. In addition greater force was required to push the broach through the workpiece. Extensive comparative tests indicate that the already popular, economical and widely used method of hand-operated keyway broaching becomes even more efficient, quick, and easy with the new tooth form. The improvement becomes immediately available in all broach sizes from 1/16" to 1".
Circle Inform-A-Gram No. A24.



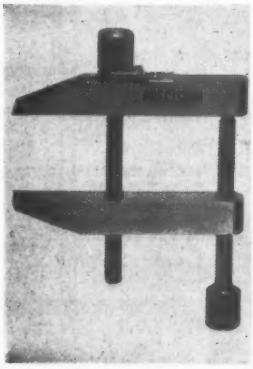
This High Speed Spring Plunger represents a new line by Vlier Mfg. Co., 4552 Beverly Blvd., Los Angeles 4, Calif. Developed especially for high speed automatic punch presses and machine tools, these "Silvertip" plungers have specially formulated specifications for long spring life with less breakage under fast flexing. Lengths from ½" to 2¼", spring pressures 1 to 6 lb. **Circle No. A25.**

Equally Efficient for Air or Hydraulic Use, this new flow control valve has recently been introduced by Pneu-Trol Devices, Inc., 1436 Keating Ave., Chicago, Ill. The new valve provides full flow in one direction and a wide range of adjustments in the opposite—or controlled direction. A floating "retro-ball" check and a unique improved gland structure of the needle are incorporated. The gland structure combines the "O" ring sealing principle with an adjustment locking feature in a compact design. A light helical



spring does not load the ball, but rather locates it in the most sensitive floating position to the seat regardless of the position in which the valve is mounted. The increased sensitivity, improved action, and higher operating pressures of the new valve permit its use in many control applications hitherto considered impracticable. Operating pressure to 5000 psi. Five valve pipe sizes are made between ⅛" and ¾". Alternative materials are brass, aluminum, steel and stainless. **Circle Inform-A-Gram No. A26.**

Toolmaker's Parallel Clamps with openings ranging ⅝" to 3½" were recently announced by Precision T. C. Co., Dept. 13, 1305 S. Laramie Ave., Cicero 50, Ill. The clamps are hardened throughout, and have metal clips provided to hold the screw in place on the return. The line is low in first cost, but is nevertheless said to compare in quality with any now on the market. **Circle No. A27.**



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ANOTHER GRINDING ROOM PROBLEM SOLVED!
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IMMEDIATE DELIVERY FROM STOCK

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Size 6" No. 218, Graduation 1/40", vernier reading .001.
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Optical Dividing Head with 48" Face Plate

An automotive manufacturer, engaged in the production of jet aircraft engines, recently placed an order for a specially built Optical Dividing Head having a face plate capacity of over 48" with the F. T. Griswold Mfg. Co. This diameter is about four times greater than any heretofore available and makes it possible to locate and make settings to an accuracy of 3 seconds for machining large jet engine components. It repeats settings in either direction and the base of the dividing head is so designed it can easily be set up for either smaller or greater swing as required.

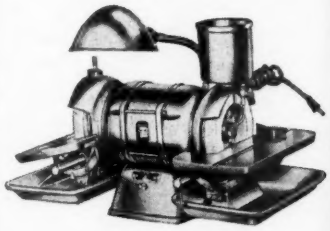
The basic design principles of the optical dividing head will permit the manufacturer to obtain fast and error free indexing and a more accurate method of aligning than with mechanical means. Positioning is rapid, no calculations or reference tables are required and effects of gear wear, backlash and oil film thickness are eliminated entirely. The housing maintains alignment even under heavy loads.

Settings will be entirely by optical means. A circular scale on which degree lines are etched, from 0° to 359°, is illuminated and degree lines are magnified and projected onto a ground glass screen. Minutes and seconds are present on a circular dial marked in 15 seconds divisions and degrees are aligned between reference marks on the screen. Direct visual reading is obtained, no focusing is required and the operator can quickly sense any unbalance between reference lines. Thus, accurate positioning is extremely fast.

Griswold Optical positioning is widely used throughout industry in production and inspection departments. It provides a faster, more dependable method of making set-ups than micrometers, loose standards, dial indicators and related equipment. Inaccuracies due to variations in pressure, backlash, gear wear and oil film thickness are eliminated entirely. Substantial savings are made possible through the speed and simplicity of operation and the elimination of rejects.

Baldor

Carbide Tool Grinder



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DON'T SCRAP IT!

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The new model AA bench and floor type carbide grinders have power to spare, and even greater ruggedness and freedom from vibration than heretofore. No increase in price!

A full one-half H. P. motor and an extra large shaft are combined with the famous Prosser features:

Quick-acting indexing tables—permits instant and accurate angle setting.

Compensation for wheel wear—permits use of virtually 100% of wheels.

Efficient—with diamond, silicon carbide, or aluminum oxide wheels, for roughing or finishing work on carbide, high speed steel, or stellite.

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6" lateral and 4" transverse continuous micrometer motion, reading direct to 1/10,000" with ZEROING dial

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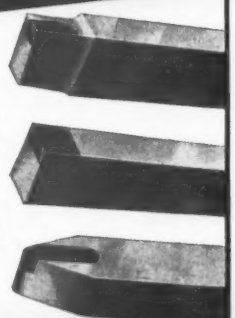

Standard tools are available either from stock or on delivery dates that meet your schedules. Advance orders for shipment on definite dates help tremendously in serving you better. Send prints for quotes and delivery dates on special tools.

Catalog gives full information on standard tools and blanks, as well as gages, centers, broaches, drills, centerless grinder rests, diamond tools and other special production tools.

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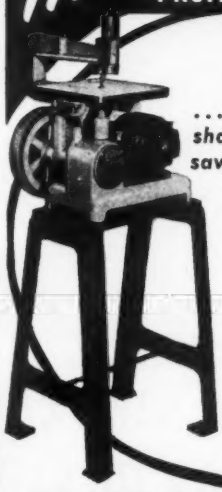
CUT TOOL AND DIE-MAKING COSTS WITH . . . Milwaukee DIE FILERS PROFILE GRINDERS



DIE FILERS
. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R. P. M. spindle speeds, ½ H. P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser. Write for illustrated Bulletins and Prices.

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- Easily installed on any press
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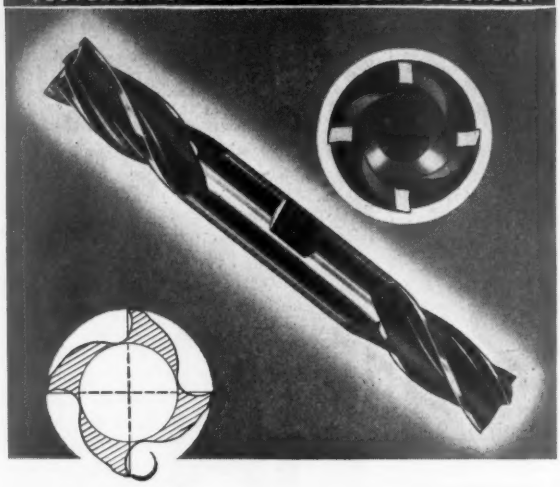


CHIPS CURL OUT INSTEAD OF CLOGGING with

WELDON

CUPPED-END END MILLS

BETTER PERFORMANCE . . . LONGER TOOL LIFE

Over twenty-five years ago Weldon opened the door to higher speeds and faster feeds by developing a scientifically designed end mill tooth. This hollow ground tooth with its curved cutting face allows the chips to *curl* out without clogging. A further means to this purpose is the Weldon "cupped-end" which prevents chips from clogging the teeth ends because it eliminates pockets which trap chips.

Another special feature originated by Weldon is the double back-off on the tooth, which gives greater support to the cutting edge, prolonging the life of the tool.

Weldon distributors throughout the U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

. . . Freeze Grinding, from page 36

thus longer wheel life. Tests so far indicate that for general purpose or production grinding an "I" grade wheel will be preferable to the previously used harder "J" grade.

Cost of Operation

The use of CO_2 as a coolant has up to now been generally found economical only on a rough grinding operation. The cost of the CO_2 is based on the size nozzle used. The following figures were recently provided by a leading supplier for general guidance:

CO_2 in an average size installation would cost $.04/lb., the operating cost thus being

for .027" nozzle — $.90/hr.
for .020" nozzle — $.46/hr.
for .013" nozzle — $.18/hr.

These figures are based on 50% actual grinding time.

An experimental kit, consisting of a solenoid control valve, five sizes of stainless steel nozzles, and necessary tubing and connections, is now available from one of the principal CO_2 sources. This apparatus is adaptable to most any type of machine or operation.

. . . Carbide Tipped Drill, from page 37

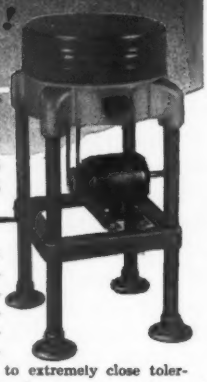
drilled to ten or twelve drill diameters without retracting the drill. This, of course, is far beyond the depth normally considered to be deep-hole drilling. For normal usage in the shop it is recommended that the drill be run at the highest speed of the drill press and fed by hand at a very rapid rate.

"Notched Drill Grind," another development of the laboratory of some years back has been introduced into the grinding of the drill. Basically this consists of grinding small notches into the cutting lips of the drill bit in such a way that the notches on opposite sides of the drill center do not cut in the same circle. The dimensions or spacing, however, are not at all critical. The notches are very quickly and easily ground into the drill by hand on the reduced edge of a silicon carbide or diamond grinding wheel.

Thus far the fluteless drills have been produced only in relatively small quantities for field trial use.

Westinghouse has not patented the drill and does not intend to do so. The sole aim has been to develop a tool which would be useful to industry at large in the drilling of plastics which are particularly abrasive to cutting tools. At the present time the Wendt-Sonis Company of Hannibal, Missouri, a producer of high quality drills, is considering the commercial possibilities of the drill.

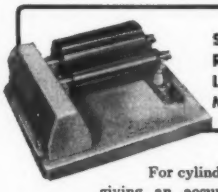
Precision LOW-COST LAPPING with Production Speed!



SPITFIRE FLAT LAPPING MACHINES

Designed for accurate lapping any material where a perfectly flat surface is important. Finishes to extremely close tolerances are produced.

The perfectly flat surfaces of sliding and rotating parts, air and liquid tight seals, plastic and die casting molds are quickly accomplished with this machine tool.



SPITFIRE ROLLER LAPPING MACHINES

For cylindrical lapping, giving an accurate, mirror-like finish in less time than any other method. Ideal for plug gauges. Saves as much as ⅔ in lapping time.

Write for Brochures, Prices and Delivery

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2395 N. Pulaski Rd., Chicago 41, Ill.

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DIAL INDICATORS!

ETALON NO. 1D precision DIAL INDICATOR

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FULLY GUARANTEED

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- 1 PIECE CASE—FORGED STAINLESS STEEL
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Measuring length	5¾"	Depth of jaw (internal)	⅝"
Graduated in	.001"	Depth of measurement from	0 to 5⅛"
Depth of jaw (external)	1⅝"	Net weight	5 ounces

HIGH QUALITY • LOW PRICE, $11.75 • IMMEDIATE DELIVERY
Leatherette Case for Calipers, $1.00

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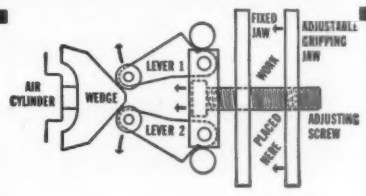
and bench operations



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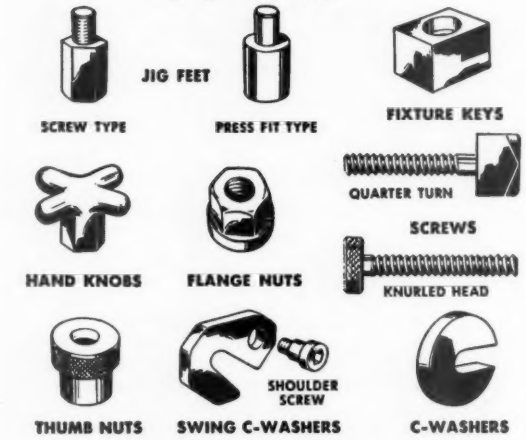
JIGS & FIXTURES
a size for every job



all sizes carried in stock
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TIETZMANN TOOL CORP.
315-317 N. MAIN ST. • DEPT. A • ENGLEWOOD, OHIO

. . . Screw Machine, from page 144

to approximately 0.90 percent, the analysis can be used as knurls or meamers.

There are a number of other types that can be used as tool materials; only a few of these will be mentioned. Thus, the manganese oil hardening steels which contain either 1.20 or 1.60 manganese, a carbon of approximately 0.95 carbon, and upon occasions both tungsten and chromium at 0.50 percent along with vanadium as a grain refiner are employed as reamers, taps and roll threading dies. Good service life on the chromium-molybdenum type steel can be expected when used as knurls; this material having about 1.0 percent carbon, 5.25 percent chromium, 1.10 molybdenum and approximately 0.25 vanadium as a grain refiner. This type material is classified as either an air or oil hardening type. Upon those occasions where a higher alloy type material is required for knurls or thread rolling dies, either of the two high carbon-high chromium steels can be used.

A high carbon low tungsten tool steel containing approximately 1.20 percent carbon, 1.60 percent tungsten and chromium of 0.70 percent along with vanadium as a grain refiner has been found quite popular in such applications as taps, threading tools, etc., where extreme hardness is desired. This material can be quenched in oil or water. Thus, a maximum of C67 Rockwell hardness can be obtained by oil quenching at 1550 deg. Fahr.; this same hardness being obtained by water quenching from 1500 deg. Fahr.

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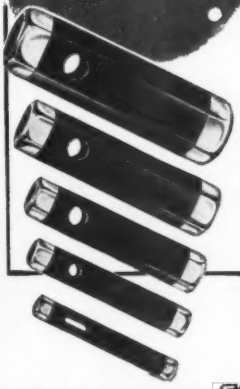
Your Production Load with FEDERAL TAPERLOCK PLASTIC GAGE HANDLES



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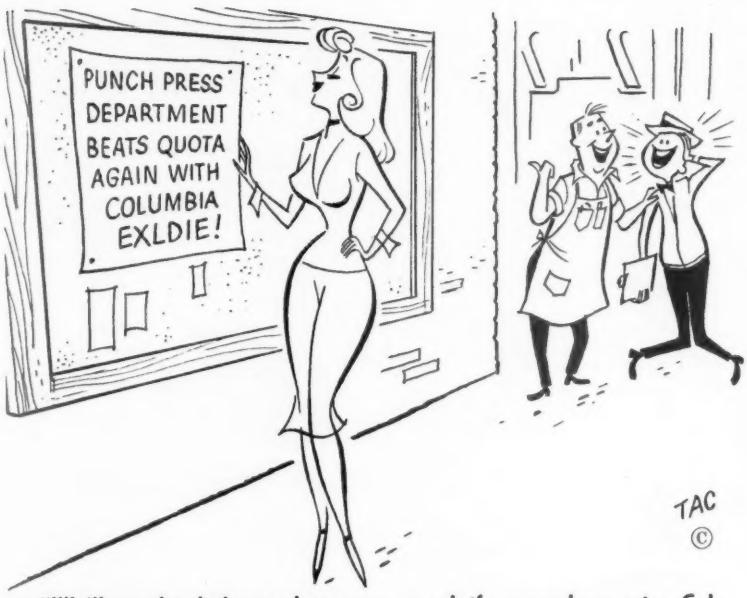

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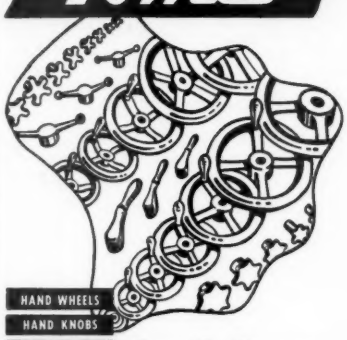

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Inexpensive, compact units, with no moving parts.

Operated from your present air supply.

Installed in a few minutes, eliminating need for costly centrally located dust collecting systems.

The collector element is mounted on the side of the machine. Quickly cleaned, requiring no refills.

Vac-suction pick-up device (vacuum nozzle) is mounted on the grinding wheel guard or close to grinding wheel on other applications. *This mounting permits constant contact with dust as the wheel is moved up or down.*

A simple needle valve operates the unit, and can be shut off when machine is not in use.

Available in two sizes: 700 series for grinding wheels 7" dia. or less—200 series for wheels 2" dia. or less.

"SALVAGE INDUSTRIAL DIAMONDS FOR DEFENSE"*

*That is the title of the National Production Authority's booklet which describes the growing critical shortage of industrial diamond supplies.

The shortage will soon result in idle machine tools, and lost defense production unless we straightway begin to conserve grinding wheels and salvage diamond dust. The N.P.A. fully and helpfully explains the methods for doing these things.

Request this N.P.A. booklet on your letterhead and Vulcan will be glad to send it to you. You will also receive literature on the versatile Vulcanaire Dust Collector which promotes health in your plant and turns dust into money.

It's made by the makers of Vulcanaire
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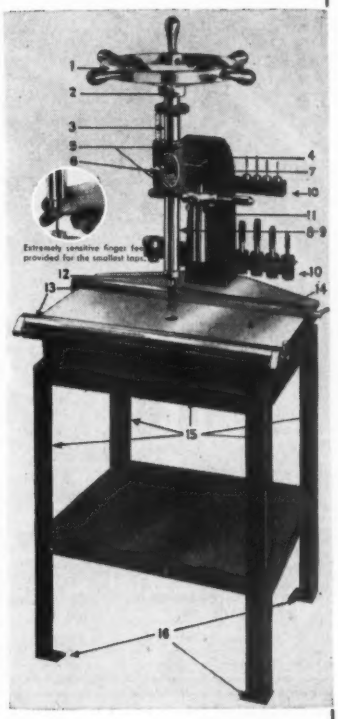
Model 12-F HAND TAPPER

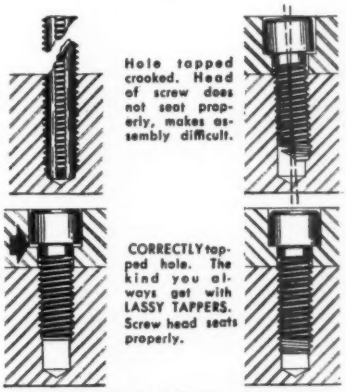
illustrated

The finest hand tapping machine made. In use in hundreds of shops, universities, experimental rooms and governmental agencies. GOOD FITS, RIGHT ANGLE HOLES, tapped to correct depth with NO TAP BREAKAGE are achieved while using unskilled labor.

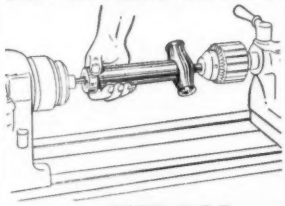


LASSY DEPTH GAUGE

consists of an instantly adjusted gauge rine on the spindle and a scale beside the main bearing. It eliminates guess work, speeds up tapping and prevents broken taps by showing exact depth tap is in work. It also speeds up assembly operations as holes are always tapped to correct depth.


Tap broken by hitting bottom.
Hole tapped crooked. Head of screw does not seat properly, makes assembly difficult.
Incorrectly tapped and hard to spot at assembly. End of screw hits.
CORRECTLY tapped hole. The kind you always get with LASSY TAPPERS. Screw head seats properly.

LASSY UNIVERSAL TAP & DIE GUIDE (See No. 11 above)



This versatile accessory assures good fits and good threads as the tool is always in line. Guide sliding on pin allows taps and dies to follow correct lead. This handy tool is ideal for all lathe tapping and threading. It can be used with power or by hand.

MODEL 12-F Tap capacity ⅛" to 1"

Complete with Holding Bars, Depth Gauge & 12 Tap Adapters #5 to ¾"	$177.00
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Complete Unit Price	$224.00

Taps not furnished — F. O. B. Plainville

Prices subject to change without notice
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The three photos at right illustrate the flexibility of 12-position indexing, whereby each tool may be used in three different working positions.

¾" square tool bit mounted in Model 4¾-S turret used for facing cut.

√ Accurate within .0005.
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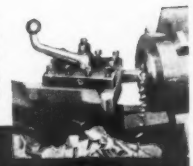
√ Hardened steel construction.
√ Mounts rigidly in compound T-slot.
√ Keeps setting accurately.
√ Indexing is self-contained—eliminates all chip-interference.

The same tool used for broadface turning merely by indexing turret one position or 30°.

Also Mfg's. of complete line of Hexturrets and "MITI-MITE" Magnetic base tools. Send for Latest Catalog.



Same tool used for inside chamfer merely by indexing back two positions or 60°.

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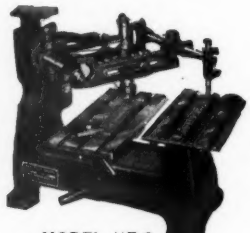

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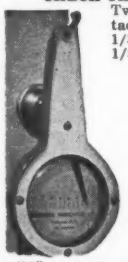

Twin telescoped contacts. Contact can be instantly changed. 1/32" is threaded within larger 1/8" contact. No screws to bother with. Double faced. Simultaneous reading front and back. Two non-breakable crystals. Being enclosed, chips and dirt cannot get in to make pointer stick.

Double faced dial indicator complete with cadmium plated holder including 1/32" and 1/8" contacts.

Black Pentrate.....$6.95
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1/32" contact, ½" long extension.....$ .75

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FULLY GUARANTEED

ASK YOUR DEALER or write
ALINA CORPORATION 401 Broadway, New York 13, N. Y.

. . . Crankshaft Tooling, from page 58

Facing and checking with carbide Grade WS—250 pieces per index of the carbide insert.

Facing main-bearings with carbide Grade WS—1500 pieces per index.

Straight plunge turning bearing diameters and chamfering with carbide Grade WS—2500 pieces per index.

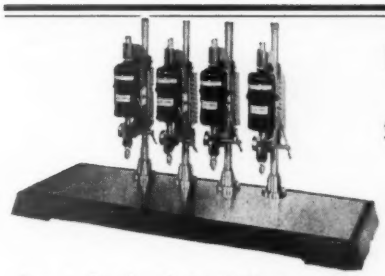
The block-type tool holder did not permit minute adjustment (except by raising or lowering the inserts). It was decided to change to the single purpose type holder. Tooling was redesigned from a multiple number of inserts in one block-type holder to one, or not more than two, inserts in each holder (Fig. 2).

To obtain the proper spacing, spacers were built into the supporting universal tool blocks. The individual holder overall dimensions are held to very close tolerances (±.00025″). All holders have the same overall length and are bolted to the tool blocks, again being positioned by spacers which control the cutting diameters of the crankshaft for size. Adjustment screws are built into the tool block. The tool blocks are held in a fixed position to the bars, slides or cradles in perfect alignment with the axis of the crankshaft. They are bolted and keyed in place.

Commercial ground inserts are acceptable for tolerances on the cheeking, radius-forming, and chamfering tools. However, it was found necessary to develop precision ground inserts for finish turning the line bearings and the stub-end. For example, a triangular insert should be held to ±.0005″ over the flat and opposite corner radius and to ±.00025″ inscribed circle.

Comparable Performance Data

Prior method with H.S.S. Tools	
Spindle Speed	36 rpm
Cutting Cycle	1 minute, 55 seconds
Production @ 80%	11 pcs/hr
Overall average of crankshafts per tool change	1.7 pcs
Coolant	Soda water
First trials with Cast Alloy Tools	
Spindle Speed	76 rpm
Cutting Cycle	1 minute, 10 seconds
Production @ 80%	19 pcs/hr
Overall average of crankshafts per tool change	5.3 pcs
Coolant	Soda water
Second trials with Cast Alloy Tools	
Spindle Speed	108 rpm
Cutting Cycle	1 minute
Production @ 80%	24 pcs/hr
Overall average of crankshafts per tool change	8.2 pcs
Coolant	Soda water
Present method with, Wessonmetal carbide Inserts, Grade WS	
Spindle Speed	High—130 rpm Low—65 rpm
Cutting Cycle	40 seconds
Production @ 80%	48 pcs/hr (with automatic loading and unloading)
Overall Average of Crankshafts per tool change	1500 pcs/index of inserts
Coolant	Soda water



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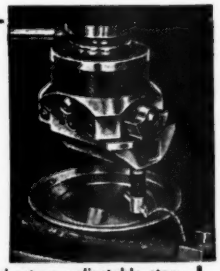

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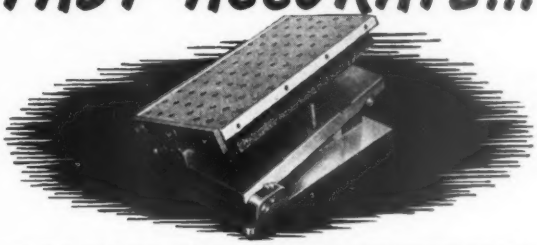

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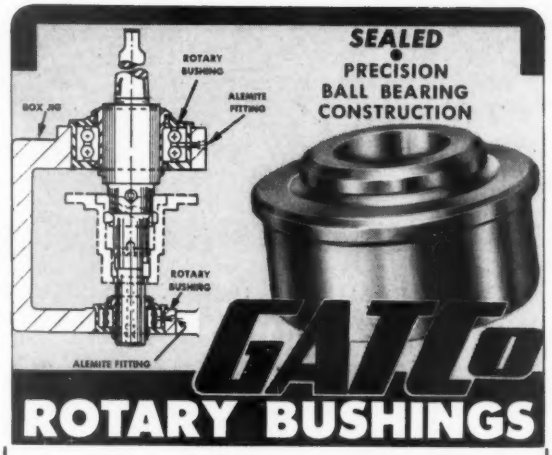

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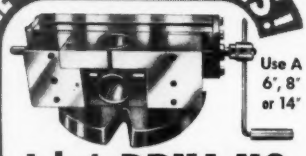

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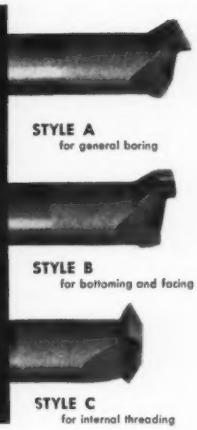

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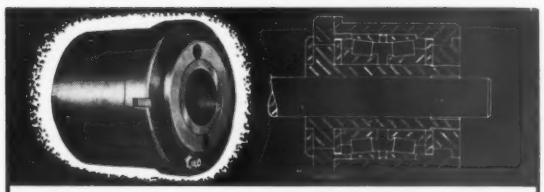

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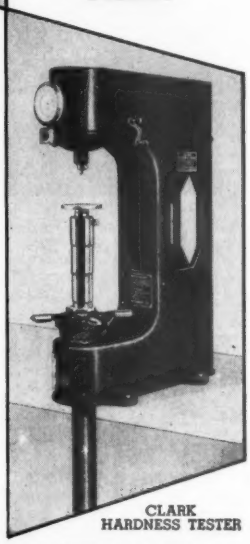

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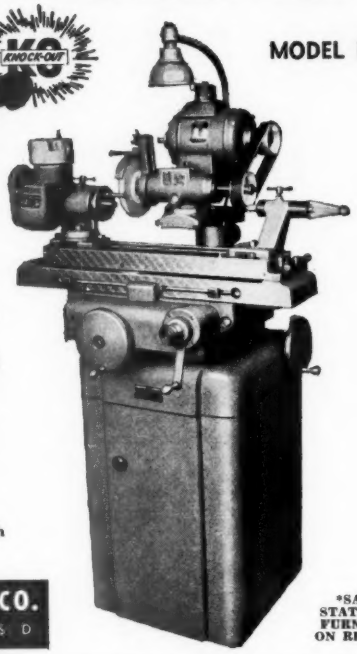

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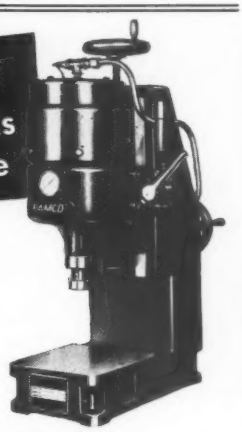
for Production Use



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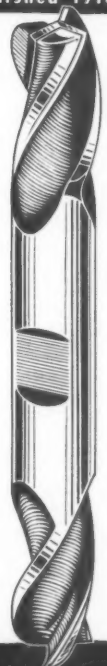

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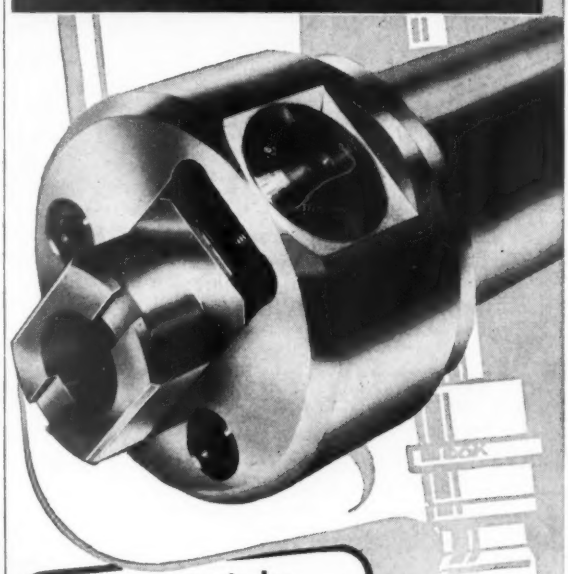

precision built by precision toolmakers for accuracy and durability in service!

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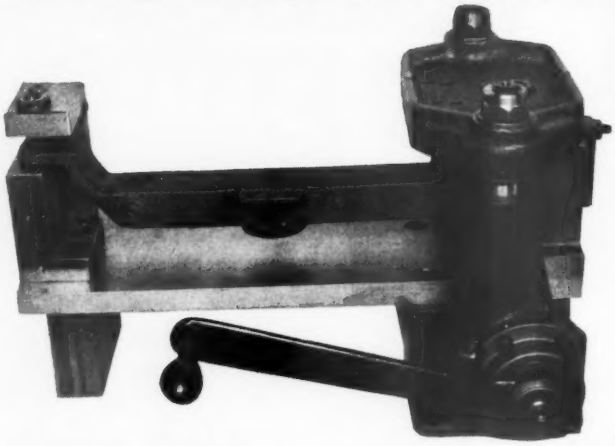

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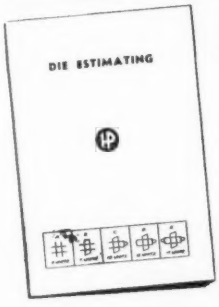

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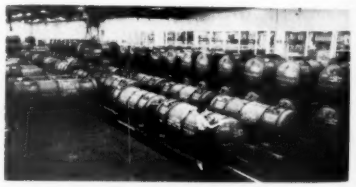

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The recently organized Die Supply Corp., 234 Carolina St., Buffalo 1, N. Y., is now serving western New York and northwestern Pennsylvania industry with DIECO die sets, components, and tool and die and machine shop accessories. Telephone number is MAdison 1964. Directing activities of the new firm are D. F. "Denny" Hawkins, sales manager and John M. Kraus, office manager. Both were formerly with the Die Supply Company at the main office and manufacturing plant in Cleveland, Ohio.

Hawkins, formerly with Flexible Company, and most recently a sales engineer for DIECO, will call on industry to offer the complete DIECO line out of Buffalo. Kraus worked up through the shop ranks at DIECO from die set assembly into the company's office, and brings a store of all-round experience to his new post.

The new Die Supply Corporation reportedly is already maintaining an inventory of popular items for quick delivery, and expects to stock an ample supply of the entire company line in the immediate future.

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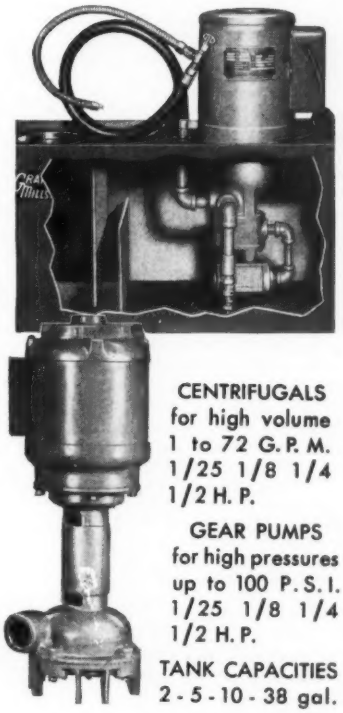

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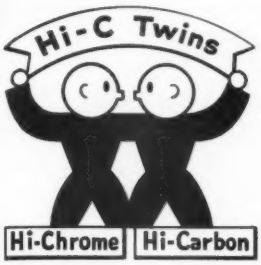

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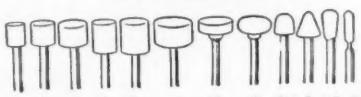

1 2 3 4 5 6 7 8 9 10 11 12

	Dia.	Depth			Dia.	Depth			Dia.	Depth
1.	1 1/16"	x 1/2"	5.		3/4"	x 3/4"	9.	A-90	1/2"	x 1/2"
2.	5/8"	x 1/2"	6.		1"	x 1/2"	10.	A-41	5/8"	x 5/8"
3.	3/4"	x 1/2"	7.		3/4"	x 1/4"	11.	A-111	1/2"	x 1 1/4"
4.	5/8"	x 3/4"	8.	A-61	3/4"	x 1/2"	12.	A-24	1/4"	x 3/4"

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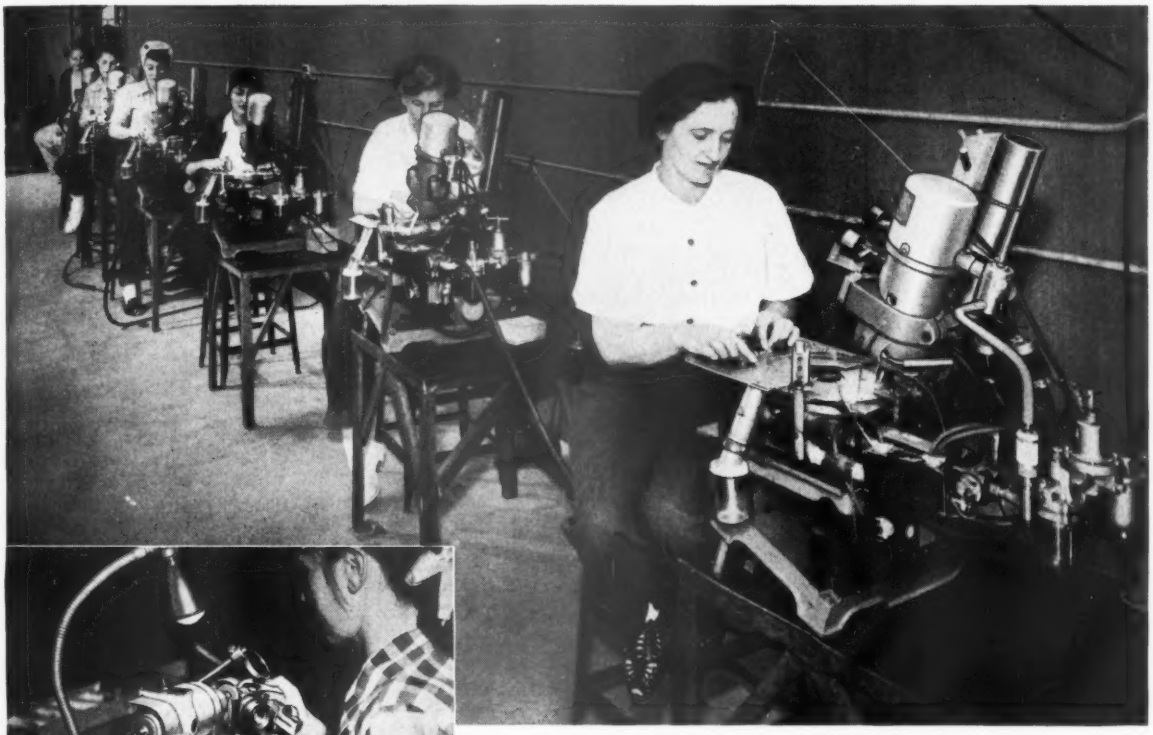

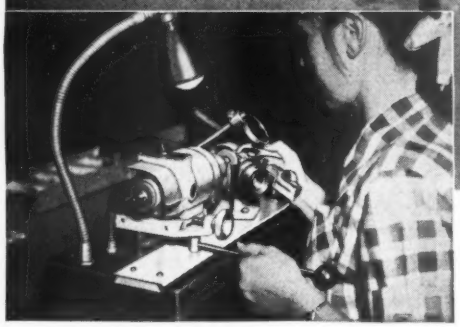

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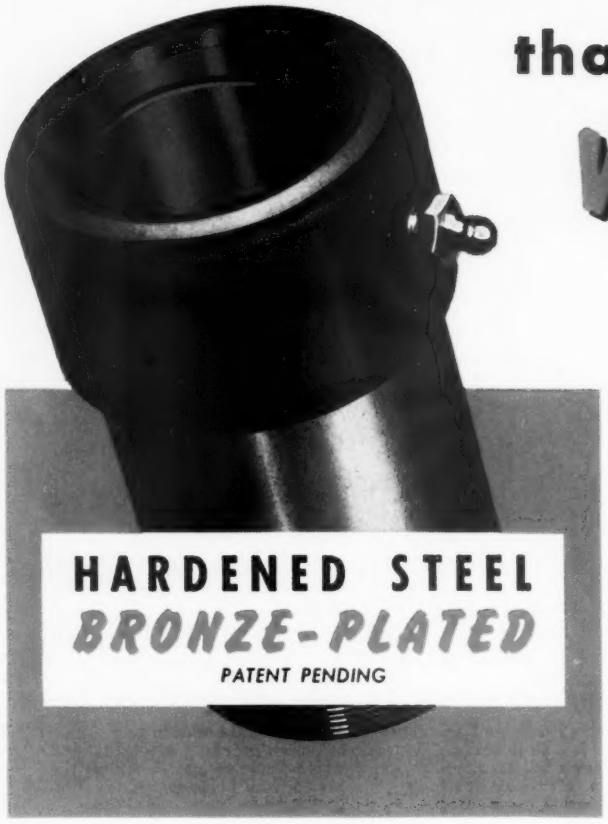

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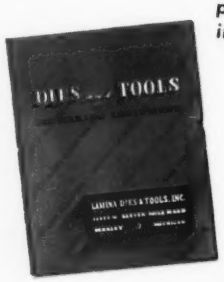

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